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THE EUROPEAN CONCERT.

As Maestro Colonne is too busy, he is not conducting this concert. This is to be regretted, since a qualified leader would be favorable to harmony and would spare our ears the frequent false notes that rend them. The "programme" announced a "Hymn to Peace." We prepared ourselves to hear the songs of plowmen, the tinkling of bells borne upon the breeze, or else the noise of the workshops. Instead of that, what is given us? An imitative cacophony composed of the roar of cannon, of crackling fusillades and of cries of agony. Is this peace? If so, I ask diplomacy what it calls war. It will not answer me; of that I am certain. So, in order to cause a question which is doubtless indiscreet to be forgotten, let us examine the musicians, and, in the first place, the sextuplet of shepherds of the people who are engaged in the affair. This is the best way to divine what threatens nations. To look at the head leads to foreseeing the motion of the arms.

Being gallant, like every descendant of the valorous gentlemen who were the cuirassiers of Palestine, let us recognize the right of precedence of Her Majesty Victoria, Queen of the United Kingdom of Great Britain and Empress of the Indies.

She is wife, daughter, mother and grandmother of sovereigns. How many crowns! How many crowns! How simple is her dress, and how kindly her face. Her drooping eyelids seem to show that she is giving herself up to the dream of those whose duty is accomplished, and that, although still living, she has taken refuge in the role of indulgent ancestor. Do not put any trust in that, however. She is slumbering, like England. She is dreaming not of the past, but of the future. She is quietly nursing the thought that it would be pleasant for her to add to the Saxon diadem and the Hindoo turban constellated with gems the

FELIX FAURE, PRESIDENT OF THE FRENCH REPUBLIC.

NICHOLAS II, EMPEROR OF RUSSIA.

WILLIAM II. EMPEROR OF GERMANY.

QUEEN VICTORIA.

FRANCIS JOSEPH II. EMPEROR OF AUSTRIA-HUNGARY.

HUMBERT I. KING OF ITALY.

GEORGE I. KING OF GREECE.

SULTAN ABDUL HAMID.

feathered head-band of southern Africa, the Egyptian pschent, and especially the tiara of the emperors of the East preserved at Constantinople. A characteristic detail: when Her Majesty plays "court music" with other powers, she takes account of no silence.

Rests, minim rests and crotchet rests are a dead letter to her. This assures her an advance. She is at Delagoa and the White Nile while her partners are still in Crete.

Such precipitation greatly displeases young Emperor Nicholas II, Czar of all the Russias, of Siberia, of the Turcoman Khanats, protector of Persia, and liberator awaited by the Radjputs of the valley of the Ganges. This absolute master of a hundred million men is the sphinx of modern Europe. His amiable and proud face remains impenetrable and his caressing eyes are full of mystery. Whither tends this young will? To what goal is he, alone clear sighted, guiding his people? That is a mystery! Russia great and France weak, some assert; Russia great and France powerful, answer others. I do not pretend to say, but confident in the decrees of that fatality which plays with all human combinations, I give it up in smiling like His Excellency Felix Faure, the amiable representative of the republic, whom the protocol embarrasses without obscuring. Firm and loyal, he is, moreover, blessed with a good stomach, the source of all good nature, of all indulgence and of all union. Grave physicians are agreed upon this point at least. He considers that wickedness is of dyspeptic origin, and, doing his entire duty, he feels pity only for those who do not do theirs —pity for the fomenters of disorder and pity for politicians who sow division in this fair land of France. Be assured that, if he had the power to do so, he would have them sent to a sanitarium in order that they might be submitted to a diet of milk and peptonate of iron. But you see he is condemned by the constitution to the troublesome device: "Nothing but good intentions."

These four words might likewise be placed as an exergue of the arms of the house of Italy, represented by His Majesty Humbert, the son of a great king. This sovereign, who has just fortunately escaped the attack of a fanatic, has also beneficent aims, but his temperament prevents him from realizing them. He is irremediably romantic. His bristling mustache, his hair, rebellious under the snow of years, and his look, which tries to be terrible, demonstrate this beyond a doubt. Passionate lover of the "plume" that he fixes to the mantle of Europe somewhat after the manner of a tin kettle tied to a dog's tail, he figures in our modern society as an expatriated Anthony, always ready, whether it is a question of Gaul, Abyssinia or Russia, to exclaim: "She resisted me and I assassinated her!" This harms no one but himself and the great people whose destiny he directs. But how many false notes! He is constantly striking too high a key!

His geographical neighbor, Francis Joseph, Emperor of Austria-Hungary, possessor of the Beautiful Blue Danube (piano morceau for four hands, by Johann Strauss), inspires in me a sort of tender respect on account of the evident misunderstanding that exists between his sympathetic and subtile face and his shako of unaccustomed form. Wherefore this paradoxical headgear, which appears to be designed for some other head than his, and gives him the appearance of a territorial warrior? Has he desired to symbolize thus the state of his empire, in which German Austria does not succeed in covering its head with Austria, and vice versa? I do not know, but I reverentially express the hope that, upon my humble advice, His Majesty Francis Joseph will consent to change his hatter.

The laugh dies away from my face. Clad in the severe frock coat of the Prussian infantry, the Emperor of Germany appears. A strange and inquieting face: the nose, the mouth and the chin are those of a soldier; the forehead and the bright piercing eyes—somewhat ironical—are those of a thinker. William II is the personification of a philosophical and warlike race.

But it seems that I am becoming laudatory, and that I am forgetting that we also have our question of Crete, down below upon that sacred river whose left bank was cleared by our ancestors. No, no; I am forgetting nothing. I am only thinking, like a true soldier of France, that it is necessary to be just, even in regard to one's enemies.

Besides, has not the great Carnot said: "It is by obtaining an accurate account of the strength of our adversaries that we learn how to conquer them"?

Such are the powerful lords of the sextuplet of peace. In order to finish the duet (from the same root as duel), let us see who has taken upon himself the execution of the "air of bravery" indispensable in every opera.

Here, in the first place, we have King George, the mentor from calm Denmark, who seems to be greatly bored because he has to lead the turbulent children of Hellas. Oh, that little Greece, as big as an egg, which is trying to kick up as much dust as a bull; what a care for a monarch!

How right La Fontaine was when he said:

Le monde est plein de gens qui ne sont pas plus sages.
Tout bourgeois veut bâtir comme les grands seigneurs,
Tout petit prince a des ambassadeurs,
Tout marquis veut avoir des pages.

Ah, little unwise Greeks, amiable bourgeois who risk ruination in order to build; petty princes, insignificant marquises, what have you done? What false advice have you listened to?

The wrath of Abdul Hamid is unchained. This Byzantine who is detonating in our Europe; this enervated descendant of the conquerors of Asia Minor and of Persia; this "sick man" is galvanized by bellicose flourishes of trumpets. He who has not been able to assimilate our civilization has preserved the brutal tradition of the warlike hordes who planted the crescent among us. Formidable, pitiless adversary, having fanatical soldiers at his disposal, he knows that the time is no longer for the heroic melees of Salamis and Platæa. Like Xerxes, he has the number, and like Themistocles, he has the discipline. Moreover, he has rifles and cannon.

Is Hellas going to be put to rest under the mausoleum of Leonidas, and, in the midst of the ravaged plains, the desolate cemetery of the Evzones, and headstrong ones of Hetniki Heteria, will a funereal column erect its lamentable shaft with this inscription: "Wayfarer, go tell Lacedemonia that we died for the great good of England"?—P. d'Ivoi, in Le Magasin Pittoresque.

THE PARIS EXPOSITION OF 1900.*

THIS exposition will afford unrivaled opportunities to make known to the world the resources of the United States and their achievements and facilities in the various fields of production. It is earnestly to be hoped that these opportunities will be improved to the fullest extent, and that not only will adequate provision be made for such representation by our government as is in keeping with its importance, but that individual manufacturers and producers will make a full exhibit of the leading products of American genius and skill.

SITE OF THE EXPOSITION.

Preparations for the exposition are now well advanced. The preliminary studies are made with great care and thoroughness, and the general scheme of the exposition is now well defined. The works of demolition and construction, for which the period of a little more than three years remaining will barely suffice, have begun and will be vigorously prosecuted from this time forward. The exposition will open April 15 and will close November 5, 1900. The site will comprise the public grounds on both sides of the Seine from the Place de la Concorde, the great monumental square in the very center of the city, to a point beyond the Pont d'Jena, embracing the Champ de Mars, the Trocadero Palace and Park (site of the Exposition of 1889), the Esplanade des Invalides, the Quai d'Orsay, the Quai de la Conference, the Cour la Reine, and a large section of the Champs Elysées, including the site of the Palais de l'Industrie, the great building erected for the International Exposition of 1855, the first of the series. No other city in the world contains, in its very center, an equal area available for a great exposition. Not only does this site leave nothing to be desired in point of convenience and accessibility, but divided as it is throughout its entire length by the Seine, winding between magnificent quays and bordered by stately edifices and historic monuments, it lends itself admirably to the works of decoration and embellishment in which the French people are past masters, and which are indispensable to a successful exposition.

ARCHITECTURAL PLANS.

All the details of the architecture are not yet worked out. The unique palace of the Trocadero, erected for the Exposition of 1878 and utilized a second time in 1889, will be used, as well as several of the great exposition halls of 1889 in the Champ de Mars, but all of them will undergo more or less modification. The Eiffel Tower will be preserved, but it is probable that some new and striking features will be added to it. The Palais de l'Industrie, which housed the entire Exposition of 1855, and in which the annual salon of the Société des Artistes Francais is held, will disappear, however, and on its site will be erected a magnificent edifice to serve as the Fine Arts Hall during the exposition, and to remain as a permanent monument. Demolition is already in progress. To the west of the Fine Arts Hall, on the same side of the Champs Elysées, will rise the Hall of Liberal Arts, which is also to be a stately and permanent edifice. Between these great buildings will be constructed a broad avenue extending from the Champs Elysées to the Seine, at the point where a magnificent bridge is being constructed, named after Alexander III, Emperor of Russia, by whose son, the present Emperor, the corner stone was laid, with imposing ceremonies, during his recent visit to Paris. This bridge will have a pronounced artistic character, and, with the projected avenue, will connect the Champs Elysées and the Esplanade des Invalides, adding a new and impressive vista to the charms of the famous Parisian avenue, with the stately golden dome which crowns the tomb of the Great Napoleon in the background.

TRANSPORTATION FACILITIES, HOTELS, ETC.

The national and municipal authorities and the management of the exposition are preparing to co-operate in improving the transportation facilities and public conveniences of Paris, and in adding, before 1900, to the already numerous attractions of the city. A number of modern hotels, some of which are already under construction, and several handsome new theaters will be built, and the magnificent Opéra Comique, now in course of erection, will be completed. Public parks, gardens, and squares will be created in all parts of the city—for example, at Upper St. Philippe du Roule and in the St. Marguerite quarter. Rows of trees will be placed at the Place de Rennes and the banks of the Canal St. Martin will be covered with turf. The rows of trees in the Champs Elysées will be doubled and still more trees will be planted in the Avenue du Bois de Boulogne. The roads leading into the Bois from the Auteuil side will be arranged in terraces, covered with flowers, and overlooking the valley of the Seine. The park and gardens on the Butte Montmartre will be finished by that time. At night, the city will be brilliantly illuminated by an extensive system of electric lights as far as the outer boulevards and including the Bois de Boulogne and de Vincennes.

It is the avowed purpose to make the exposition surpass all its predecessors, both in France and elsewhere, not perhaps in extent or in architectural features, for it is conceded that in these respects there is little hope of eclipsing the great achievements at Chicago, but in its artistic aspects, in the logical, comprehensive, and scientific system of classification and award, and in the uniformity and harmony of the whole. In a word, the ambition of the projectors lies chiefly in the direction of artistic excellence and general ensemble.

OPPORTUNITIES FOR AMERICAN INDUSTRY AND ART.

The exposition will offer rare opportunities for American artists, inventors, manufacturers, and workers in every field of human effort to illustrate once more to the world the vastness of our resources, the superiority of many of our industrial implements and processes, and the variety and excellence of our productions. It is hoped that American manufacturers and producers in all lines will be fully represented. It is with a view to furnishing the information which every person who contemplates exhibiting will desire that this report has been prepared.

GENERAL PROJECT.

The first international exposition was held in 1855, the second in 1867, and the third and fourth, respectively, in 1878 and 1889. The interval between the first and second was twelve years; eleven years separated the second and third, and a like period the third and fourth. The exposition of 1889 was scarcely terminated when the public opinion of France spontaneously fixed 1900, the closing year of the century, then eleven years distant, as the date of its successor. In July, 1892, the official initiative was taken in the matter by M. Roche, then Minister of Commerce and Industry, in a formal communication to President Carnot.

On July 13, 1892, President Carnot issued a decree announcing "a universal exposition of works of art and of industrial and agricultural products," and fixing the date thereof. The preliminary studies were made and a financial scheme devised by a temporary commission. The permanent administration was placed in the hands of a commissary general attached to the Ministry of Commerce, Industry, and Colonies, and assisted by a consultative body styled "Commission Supérieure de l'Exposition," selected from the Senate, the Chamber of Deputies, the Conseil d'Etat, the Conseil Générale de la Seine, the municipal council of Paris, the academies, learned bodies, colleges and universities, the chambers of commerce of the fourteen leading cities, leading financial institutions, various branches of the public service and the leading industries, such as agricultural, transportation, manufacturing, etc., together with the representatives of the press, and all the surviving Ministers of Commerce who had held office since 1878. The service was organized as follows:

Secretariat general (general business, employes, medical police and fire service, press, complimentary admission).

Architecture (erection of palaces and pavilions, control of metallic structures and of all devices erected by foreign nations, colonies, and industrial exhibitors).

Roads, streets, parks, gardens, water, and lighting.

Exploitations (French, foreign, and colonial sections, installations, fine arts, agriculture, catalogues, diplomas, and medals).

Finances.

Litigation.

Fêtes.

FINANCIAL ARRANGEMENTS.

One hundred million francs ($20,000,000) was provided as a guaranty fund for the exposition. Of this amount, 20,000,000 francs was appropriated by the national government and 20,000,000 francs by the city of Paris, while 60,000,000 francs represent the net proceeds of an emission of 3,250,000 bonds of 20 francs each. These bonds were issued by the government with the co-operation of five leading financial institutions—the Crédit Lyonnais, the Crédit Foncier, the Comptoir National d'Escompte, the Société Générale pour Favoriser le Development du Commerce et de l'Industrie en France, and the Société Générale de Crédit Industriel et Commercial. These institutions underwrote bonds to the amount of 2,400,000 francs and receive a commission of 5 per cent. on the sales. After providing for this commission and for the other expenses of the issue, there remain 60,000,000 francs which are deposited at the Caisse des Dépôts et Consignations, until 1900, at 2½ per cent interest, the Bank of France agreeing to make advances from time to time for preliminary expenses to the amount of 6,000,000 francs at 1¼ per cent. interest, upon the security of receipts of the Caisse des Dépôts et Consignations for deposits of the profits of the bonds.

Any surplus that may remain, after the expenses of the exposition are defrayed, will be divided equally between the national and municipal treasuries.

GENERAL REGULATIONS.

The general regulations, as formulated by the commissary general and the consultative commission and approved by the Minister of Commerce, Industry, Posts, and Telegraphs, were promulgated by President Casimir-Perrier, August 7, 1894. These regulations comprise one hundred and eight articles in twelve sections, and all provisions of the same which will affect intending American exhibitors are embraced in the summary which follows. In most respects, the regulations are similar to those of the Exposition of 1889. A few radical innovations are made, however. The regulations are more elaborate and detailed than those of the last exposition, the administration having endeavored, so far as possible, to cover every detail of the great enterprise which could be anticipated, and to leave for subsequent determination only matters of a special, secondary, or accessory character.

Section 1.—Constitutive elements, general organization of services.—All nations are invited to participate on equal terms. To the contemporary exposition will be joined a retrospective centennial exposition, reviewing the progress accomplished since 1800 in the various branches of production. All machinery, so far as possible, will be operated on the grounds in full view of the public. Special expositions (historical, anthropological and ethnological, etc.), special competitions (agricultural implements, live animals, etc.), musical performances, and special congresses of various kinds, will be held in connection with the exposition. Article XII, fixing the relations between the administration of the exposition and foreign exhibitors, is as follows:

"Each foreign nation participating in the exposition will be represented by a commissioner or delegate, who will have the sole right to treat with the commissary general, the director general, and the directors as to all questions which concern his countrymen, and specially those relating to the distribution of space among the different countries, the erection of buildings, and the admission and installation of exhibits. Foreign exhibitors must correspond with the commissioners of their respective countries and cannot communicate directly with the administration of the exposition. This regulation will be imperative except as regards the retrospective centennial exposition."

This latter will be absolutely distinct from the foreign sections of the contemporary exposition, and the administration may treat directly with foreigners possessing objects desired for the collections of the history of labor for the century.

ADMISSION OF EXHIBITS.

The principal regulations as to the admission are:

Works of Art.—The contemporary exposition will be open to the works of French and foreign artists executed since the 1st of May, 1889. Copies (even those representing a work in a different class from that of the original), paintings, designs or engravings unframed, engravings obtained by industrial processes, and sculptures in clay will not be admitted. Applications for admission will differ according to the class to which the proposed exhibit appertains and must conform to the

* United States Consular Reports.

models to be prescribed by the commissary general. They will contain a designation of the work, giving its dimensions and mentioning the expositions at which it has been exhibited. Printed forms of application will be furnished gratuitously. No artist will be permitted to exhibit more than ten works. Artists of France and French colonies must file their applications between the 16th and 31st of May, 1899. Applications for the admission of the works of foreign artists must be made through the commissioner or delegate of the country of which the applicant is a citizen. They must receive the approval of the Minister of Beaux Arts not later than December 31, 1899, and will then be definitely acted upon by the commissary general. Artists of countries not represented by a commissioner must file their applications with the commissary general (service des beaux arts) before December 1, 1899, and deposit their works at the Fine Arts Palace between December 5 and 20, 1899. They will be passed upon by a special jury, composed of Frenchmen and foreigners, appointed by the Minister of Beaux Arts and the Minister of Commerce and Industry, whose report must be submitted on or before December 31, 1899. The commissary general will transmit the proper certificate to all artists whose works have been admitted. The latter must furnish, not later than February 15, 1900, a statement giving his full name, date and place of birth, names of his masters, mention of his recompenses at Paris expositions, subject and dimensions of his works, and names of their owners. Printed forms for this statement will be supplied. One or several special commissions will be created to prepare the centennial exposition. The commissary general will decree, upon the recommendations of these commissions, a list of the works admitted to such exposition, and will cause certificates of admission to be delivered to the proper persons.

Industrial, Agricultural, and Miscellaneous Objects.—All industrial and agricultural products will be admitted to the contemporary exposition except (1) those of an explosive and fulminant character; (2) primings, fireworks, matches, and analogous articles, except in a state of imitation and containing no inflammable material; (3) spirits, alcohols, essences, oils, corrosive matters, and all fluids or substances of an unwholesome or offensive character or which can alter or injure other exhibits, unless the same are inclosed in solid vessels, appropriate in form and of small dimensions. Applications for admissions of all products must be made on printed forms which will be supplied gratuitously by the commissary general. Applicants requiring gas, steam, or water will state in their applications the quantity needed. Those desiring to operate machinery will state the speed at which the same will be worked and the kind and quantity of motive power required. The admission of foreign products will be authorized by the commissary general upon the propositions of the commissioners of the various countries, which must be filed on or before February 15, 1899, and for all articles which, for special reasons, are to be exhibited in a class section, on or before February 1, 1899. The committees of admission, each for its class, will prepare the organization of the centennial exposition, and the director general of the exposition will decree the list of objects accepted and deliver certificates of admission.

SHIPMENT, RECEPTION, INSTALLATION, AND RESHIPMENT OF EXHIBITS.

(1) Works of Art.—All works of art must be deposited at the fine arts building between February 15 and 20, 1900, under arrangements to be prescribed by the commissary general. All expenses of packing, unpacking, repacking, transportation to and from the exposition grounds, and storage and preservation of cases will be at the charge of exhibitors so far as the contemporary exposition is concerned, but such expenses as to the centennial exposition may be assumed by the administration of beaux arts. All expenses of installation of exhibits, decoration of the halls and interior, guardianship of the Fine Arts Hall, etc., will be assumed by the administration of beaux arts, save as to special arrangements made at the instance of the commissioners of foreign countries, which will be at their charge. No work admitted can be removed before the close of the exposition, whether it shall have been sold or not, except under special permit issued by the commissary general at the instance of the director of beaux arts. All works exhibited must be removed within one month after the close of the exposition.

(2) Industrial, Agricultural, and Miscellaneous Exhibits.—All objects admitted will be introduced into the exposition between December 1, 1899, and February 28, 1900, according to the regulations to be prescribed by the commissary general. Due notice will be given of special tariffs made to exhibitors by railroad, steamboat, or other transportation companies. No charge will be made to exhibitors for space, water, gas, steam, or other motive power required by them, but connections with main gas, water, or steam pipes, counter and auxiliary shafting, etc., will be provided by exhibitors. All expenses of packing, unpacking, repacking, installation, storage, and preservation of cases and transportation to and from the grounds must be borne by exhibitors in the contemporary exposition. The expenses of installation will include the establishment of special passageways, the construction of all special partitions, ceilings, windows, platforms, railings, fixtures, etc., all of which must conform to the plans adopted by the exposition management. As to certain of these constructions, the administration reserves the right to execute them in whole or in part at the expense of the commissioner of the department or of the country to which they appertain. All or a part of such expenses in connection with the centennial exposition may be assumed by the administration. Workmen exhibiting on their own account in the contemporary exposition will be relieved of all expense on account of installation. No special construction within the exposition grounds will be authorized until the plans of the same, embracing also the approaches and the interior arrangements, have been approved by the management. A committee of installation will be created for each class of groups, works of art excepted, which will apportion the space among the exhibitors, prepare and submit to the administration plans of installation and decoration, supervise the execution of the same, provide for maintenance and guarding, and assess expenses upon exhibitors and collect the same. The commissioners of foreign countries will make their own installations in the positions erected by them and in the parts of the general building assigned to them, all plans for the same to be submitted for approval to the administration. All exhibits, without exception, must be made in the name of the person, firm, or company signing the application for the same, but the names of persons of every grade who may have contributed in any way to the preparation of the exhibit may be added. All exhibitors in the contemporary sections are expressly invited to mark their exhibits with the market prices of the same, but this is not compulsory. All exhibitors of dangerous, insalubrious, or objectionable articles of any kind must conform strictly to the conditions prescribed for such exhibits, and all such articles must be removed at any time when required by the administration. No exhibit can be removed before the close of the exposition without a special permit, except those produced on the grounds under special authorization. All exhibits, installations, and special constructions of every kind must be removed, at the latest, six weeks after the close of the exposition, at which time the management will remove the same at the charge of the exhibitors. The materials will be placed in a public warehouse, and if the charges are not paid by June 30, 1901, the same will be sold and the net profits turned over to the assistance publique, or poor fund of the state.

REGULATIONS AS TO TARIFF DUTIES, INDIRECT TAXES, AND OCTROI, OR MUNICIPAL DUTIES, ON EXHIBITS.

The provisions under this head are very liberal as regards foreign exhibitors. The exposition grounds are constituted a bonded warehouse. Foreign exhibits may enter France through any custom house. They should be accompanied by a bulletin from the shipper, attached to the bill of lading and indicating their nature, class, weight, and place of origin. These goods will be transported directly to the exposition grounds under the conditions of international or domestic transit at the choice of the shipper. They will be exempt from statistical dues and from inspection at the frontier. Seals will be affixed without charge. All foreign products will be taken in charge at the exposition grounds by the special customs agents, and, if finally entered for consumption, will be subject only, whatever their origin, to the duties imposed upon like products from the most favored nation. Articles manufactured on the grounds from imported materials will be subject only to the duties to which such materials from the most favored nation are liable. The manufacture of tobaccos by machines and apparatus exhibited will be authorized on the express condition that the goods so produced shall be subject to all the duties and excises prescribed by law. No foreign goods will be subject to indirect taxes or municipal dues (octroi) unless entered for consumption.

PROTECTION OF EXHIBITS.

No work of art or exhibit of any kind can be copied or reproduced except by a special permit of the exhibitor, approved by the administration. The taking of general photographs, however, will be authorized. Inventions susceptible of being patented, plans and specifications of machinery, etc., will be fully protected. The administration expressly disclaims all responsibility for damages to exhibits in the temporary sections by fire or otherwise, although every precaution will be taken for their protection. The administration will, however, be responsible for losses or damages in the retrospective sections, but only to the amounts agreed upon in advance with exhibitors and stated in their certificates of admission. The administration will provide a corps of guardians for the general surveillance of the buildings and grounds, but the commissioners of foreign countries will be required to provide guards for their pavilions and for their space in the main buildings. These guardians will have to be named subject to the approval of the administration, which may, at the time, demand their revocation or dismiss them outright in case of drunkenness on duty or of detection in dishonesty. They must be uniformed, must clean the buildings or sections to which they are attached, and must conform to and enforce all police regulations.

CATALOGUES.

A general catalogue will be prepared in the French language, naming the works and productions of all nations on exhibition, with the names of exhibitors and the location of exhibits in the buildings or grounds. Each country will have the right to publish in French, as well as in its own language, at its own cost, risk, and peril, special catalogues for its buildings and sections, which, however, must contain no objectionable advertisements or other matter. The sale of these catalogues on the exposition grounds will be regulated by the administration, and will be subject to the payment of a royalty.

RECOMPENSES, DIPLOMAS, ETC.

All works and products exhibited will be passed upon, as in 1889, by an international jury, which will have three degrees of jurisdiction—juries of class, juries of group, superior jury.

The juries of class will be composed of full members and substitutes. The number of full jurors, French and foreign, will, as nearly as practicable, equal one-sixtieth of the whole number of exhibitors, and there will be one-third as many substitutes as full jurors. In the several classes, the number of full jurors will be, as nearly as may be, proportional to the number of exhibitors and the importance of the exhibits. The French jurors will be chosen in part from the higher grades of the public service, learned bodies, and educational institutions, but will consist, for the most part, of those who have received, either as exhibitors or as jurors named by the French Government, high recompense at the international expositions of Paris, London, Vienna, Philadelphia, Sydney, Melbourne, Amsterdam, Antwerp, Barcelona, Brussels, or Chicago. Foreign jurors will be named by the commissioners of the respective countries, and their appointments must be signified to the commissary general before the opening of the exposition. Excepting for the group of works of art, the juries of class will have the right to call, for consultation only, either as experts or associates, persons of special competence on any matter submitted for their judgment. Each jury of class will elect its own officers, but the president and vice president must be of different nationality—the one a Frenchman, the other a foreigner.

The juries of group will consist of the presidents, vice presidents, and rapporteurs of the juries of class, and of a president, two or three vice presidents, and a secretary, who may be chosen outside of the juries of class.

The full composition of the superior jury is yet undetermined. Among the members ex officio will be the commissioner of every country represented in the official catalogue by the names of more than five hundred exhibitors. The work of the international jury will be under the supervision of the commissary general and the directors general.

"Each jury of class will proceed to the examination of objects exhibited, and will prepare—(1) a list of exhibitors hors concours (those who cannot compete for recompenses as hereafter mentioned); (2) a list, by order of merit and without distinction of nationality, of recompenses proposed to be bestowed upon exhibitors; (3) a similar list to the preceding for the collaborators, engineers, foremen, and workmen who may have distinguished themselves particularly by the production of remarkable works figuring at the exposition. For art industries, the list of exhibitors to be recompensed will be divided into two sections—one devoted to the authors of designs, cartoons, sketches, etc., the other to the manufacturers. Two sections will also be devoted to the materials or processes of production and to the products, when these elements are found united in the same class. These lists, properly certified, will be submitted to the commissary general not later than June 30, failing in which they will be made by the jury of group."

The lists prepared by the juries of class, in the manner just indicated, will be revised by the juries of group, with a view to assuring unity and harmony in the distribution of awards. The revised lists will be submitted to the superior jury not later than July 31, 1900.

The superior jury will make the final revision of the lists by order of merit, and the distribution of awards will be made on or about September 1, 1900. For the temporary expositions and competitions in the groups of agriculture, horticulture, and food stuffs, the operations of the international jury will continue throughout the exposition. The juries of class will prepare the lists of awards at the end of each temporary exposition or contest, and these lists will be finally revised by the juries of group at the conclusion of the series of such expositions. All the deliberations of the international jury will be rigorously secret.

"Each of the reporters of the class juries will, within six months after the close of the exposition, present to the commissary general a report setting forth the principal facts established by the jury, describing the progress achieved since 1889, and reflecting the general conditions existing at the close of the nineteenth century."

These reports will be published by the government, together with an official list of the awards.

Only diplomas will be granted as recompenses. They will be thus classified: Grand prize diplomas, gold medal diplomas, silver medal diplomas, bronze medal diplomas, honorable mention diplomas.

No exhibitor acting as a juror and no firm or company represented on a jury by any member, stockholder, agent, or employe will be eligible to an award. Persons exhibiting in several classes may receive awards in each class, but no one shall receive more than one award in a single class. Exhibitors sharing jointly a show case or other space may compete for awards if their exhibits are strictly individual. Only one award can be made for a collective exhibit, but every person interested may receive a diploma bearing the names of all participating exhibitors. Commemorative diplomas may be awarded to all persons who have co-operated effectively in the retrospective exposition.

ADMISSIONS.

The regular price for the afternoon will be 1 franc (19·3 cents). For mornings, afternoons and special days, the admission price may be increased. Season and monthly tickets will be offered at a reduction. Each exhibitor in the contemporary exposition will be given a complimentary season ticket, and the necessary employes at his exhibit will also receive complimentary admissions.

CONCESSIONS.

Concessions and privileges for entertainments, refreshment booths, etc., will be granted by the Minister of Commerce, Industry, Posts and Telegraphs upon the recommendation of the commissary general. All privileges for pecuniary benefit must pay a royalty or percentage of receipts to the exposition. No advertisements, catalogues, or prospectuses can be circulated in the exposition grounds except under special license, for which a suitable fee will be charged.

CLASSIFICATION OF EXHIBITS.

The vexed question of classification has been profoundly studied in all its aspects by M. Picard, the accomplished commissary general, and by the superior commission. The difficulties—in fact, the utter impossibility—of devising a scheme of classification absolutely logical and entirely free from practical disadvantages were fully recognized. The commission examined with great care the classifications of all the international expositions of the past, both in France and other countries, and considered fully the various criticisms to which they have been subjected in the light of the actual results achieved. The report of the commissary general upon this subject is an able and comprehensive paper, in which the various theories of classification are impartially discussed and the advantages and disadvantages of each fully set forth. Of the classification at the Philadelphia Exposition of 1876, it is said that, "while it was inspired by a lively appreciation of that which constitutes the value of man and the grandeur of the peoples, it would have been improved had it been less heterogeneous." Of the classification at the Chicago World's Fair it is said: "Notwithstanding its real merits, it cannot be considered a model to imitate. It erred notably in the minute subdivision of the classes."

For the classification at the approaching exposition, that of 1889 is taken as a point of departure, and such modifications have been made as were suggested by the legitimate criticisms of which it was the object and by the lessons taught by foreign expositions.

The post of honor is occupied by education—"the channel by which man enters into life, the source of all progress." Next come works of art, and the third place is assigned to the instruments and general pro-

cesses of letters, sciences and arts. Then come "the great factors of contemporary production, the most powerful agents of industrial achievement at the end of the nineteenth century"—the material and general processes of mechanics, electricity, civil engineering, methods of transportation. Next follow the exploitation and the products, superficial or subterranean, of the earth—agriculture, horticulture, forestry, the chase, fisheries, placer mining, food stuffs, mines, and metallurgy. Next in order are the decoration and furnishing of public buildings and habitations, threads, yarns, tissues, textile fabrics, wearing apparel, chemical industries, various manufactures. "Social economy, to which have been reserved the developments worthy of its actual role, follows naturally the various branches of artistic, agricultural, and industrial production." It will embrace also hygiene and public or organized charity.

A new group has been created for the "moral and material work of colonization," and the series closes with the military and naval group.

In all there will be eighteen groups and one hundred and twenty sections, as compared with twelve groups and nearly a thousand sections at Chicago.

An interesting innovation has been introduced in the classes of decorative arts, each of which will comprise two sections—one for the authors of designs, cartoons, sketches, etc., the other for the manufacturers. Each section will receive distinct awards, so that the artists will not be gathered together, but will be dispersed through the buildings and grounds. "If," says the commissary general, "the visitors are deprived of the imposing spectacle which was afforded by the immense accumulations in the old gallery of machines, if the grand effect of mass and multiplicity due to such concentration is lost to them, they will no longer pass by engines and apparatus without suspecting their purpose or their manner of operation; the confusion of their minds will be dissipated; they will comprehend and will be instructed, which is the chief object of these periodical assizes of industry." SAMUEL E. MORSE,

Paris, December 24, 1896. Consul General.

THE BURNING OF THE FRENCH CHARITY BAZAR.

PARIS has nothing in its history in the way of an accident which can properly compare with the burning of the Bazar de la Charité in the Rue Jean Goujon, Paris. The last great fire with which Paris was visited was the burning down of the Opera Comique, May 25, 1887, when nearly two hundred lives were lost. The victims of that fire were nearly all unknown, while those who perished in the Bazar on May 4 were persons of high social position, many of them belonging to the most exclusive Royalist and Catholic families of Europe, the greatest victim being, without doubt, the Duchesse d'Alençon, who was an Orleanist princess closely related to the house of Austria, the duchess being a sister of the Empress Elizabeth of Austria.

The grand Bazar de la Charité was held in a flimsy structure built on vacant lots which were loaned for the purpose. The building was only a temporary one, being simply made out of planks and cloth. The bazar was held by a representative syndicate of the chief charitable institutions of the city, which every year unite for the purpose of selling all kinds of articles, the profits of which are devoted to the relief of the poor. The receipts each year have amounted to about one million francs.

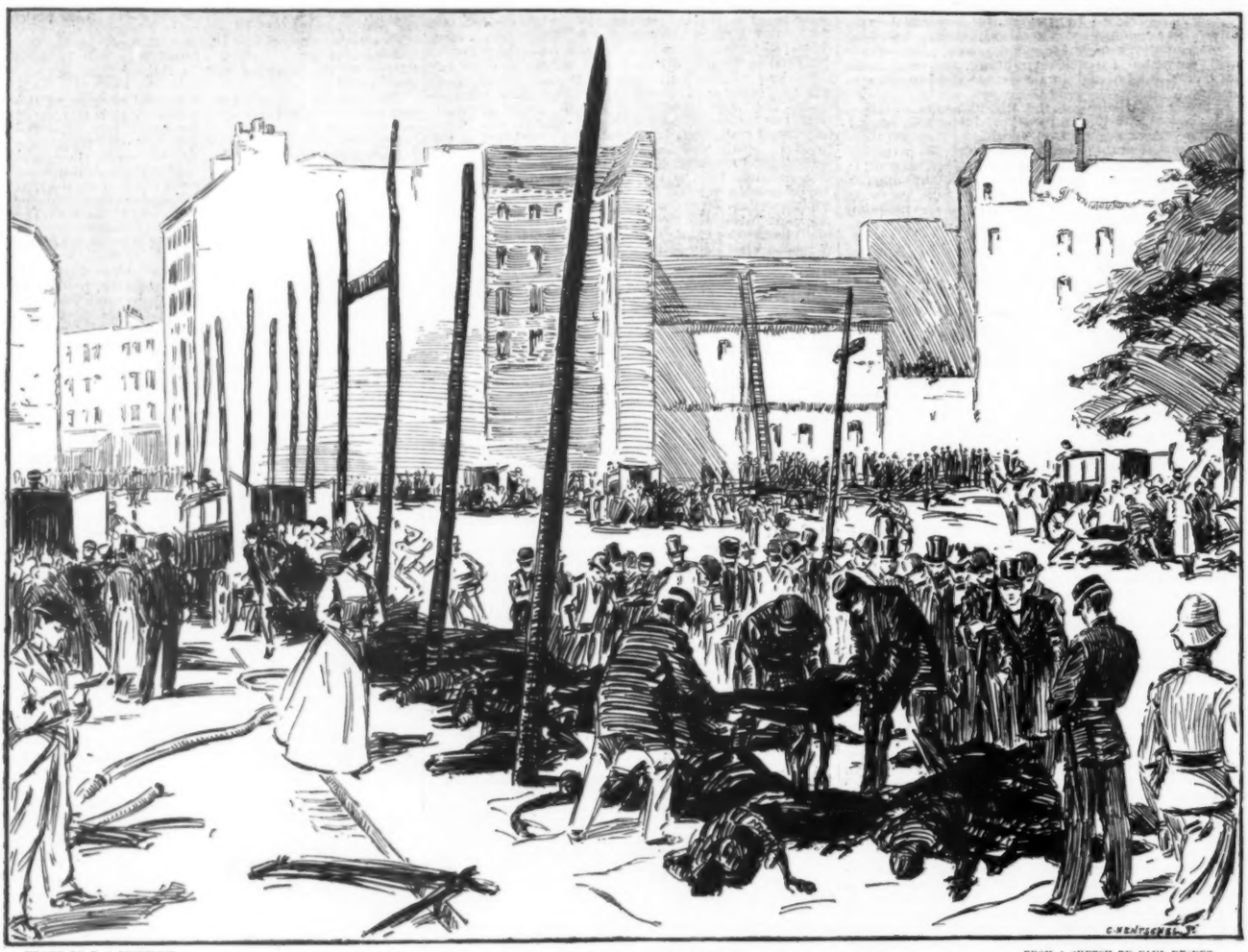
The fire started at 4:30 P. M. in the cinematograph booth. An employe finding the cinematograph lamp burning badly, he tried to fill it with ether. In order to do so, he struck a match to enable him to see more clearly. The vapor of the ether ignited and instantly spread to the hangings around the apparatus. Flames then burst out and a fearful panic ensued among the people; the flames spread with great rapidity, the building being filled with inflammable materials. There were nearly eighteen hundred people attending the bazar, and when the cry of fire was raised a wild rush was made for the exits, which were completely blocked. Many were knocked down and trampled to death, while a large number were suffocated. It was first thought that the loss of life did not exceed thirty, as that number of dead were speedily recovered and laid side by side on the ground, but it was soon known that this was but a small part of those who were killed. In addition to those who were crushed or suffocated, it appears that many others who might have escaped were caught under the roof, which collapsed in a few minutes after the fire started, the uprights supporting it having been burned away. Many ladies whose dresses caught fire ran into the crowds near the exits. In this manner the fire was communicated to the clothing of others, who were partly burned or perished miserably.

One of the most painful subjects in connection with the fire was the part played by the men present when the fire broke out. Almost all the Paris journals have touched upon the subject, most of them saying the men did not hesitate to save themselves at the cost of the women, even going so far as to strike them down with their canes in order to assure their safety. The cowardice which they displayed in abandoning the women to their fate and the brutality they used in trying to save their own lives afford an unpleasant picture. As a contrast it is pleasant to think of the conspicuous bravery of many of those in the lower walks of life who happened to be passing, some of whom were fatally injured in attempting to release the unfortunates.

Throughout the night immense crowds surrounded the Palais d'Industrie, where the recovered bodies or portions of bodies were deposited. Over one hundred and forty persons, mostly women, were burned in the fire. The injured numbered hundreds and filled every hospital in Paris. The French Cabinet held a special council, at which telegrams of condolence were received from most foreign rulers. The Minister of Foreign Affairs announced that all of the diplomats had visited the foreign office to offer their condolences. On May 8 a memorial service was held in the Cathedral of Notre Dame for the dead. The decorations of the church were of the same design as those used at the funeral of President Carnot. The cathedral was crowded with ministers, diplomats and persons of prominence. Cardinal Richard and President Faure were present.

Though far away in Sicily, the Duc d'Aumale fell indirectly a victim to the fire. The duke was prostrated by the shock of the fire when he learned that the Duchesse d'Alençon was killed. The Prince de Joinville is now the only surviving son of King Louis Philippe. In presenting his princely domain of Chantilly to the nation, the duke has left behind a monument which will render his memory illustrious for ages.

The lesson of the great fire is obvious. The fair should never have been permitted in such a tinder box, and the result must be regarded, not due to an inefficient fire department, but to lack of stringent building laws. Unfortunately, in France the authorities are sometimes lenient regarding such permits, on account of political reasons. The laws regarding fire protection in New York especially are not set aside for anybody. As to deaths by panic, such a cause of loss of life is rather remote, as our local ordinances are very stringent regarding the number and location of exits. For our engraving we are indebted to the London Graphic.



DRAWN BY F. C. DICKINSON. FROM A SKETCH BY PAUL DE-VEZ.

THE TERRIBLE FIRE AT THE CHARITY BAZAR IN PARIS.

will be recognized as exhibitors and not as collaborators.

In all departments of the exposition, so far as practicable, materials and processes will be found in contact with products. All machinery will be operated under the eye of the public, so that visitors may familiarize themselves with its practical workings and follow the successive transformations of the crude material until it assumes the form of the finished article. Exhibitors will not be required, however, to expose methods and processes of fabrication an important element of whose value is their secrecy.

In so far as is compatible with the vast extent of the exposition grounds and the necessary dispersion of the exhibits among several main halls and the pavilions of different countries and of important exhibitors, the arrangement of the exposition will be such that all the products of a single country will be brought into juxtaposition, as well as those of different countries, pertaining to one class of industry. Thus, in proceeding in one direction, the visitor may review successively the various exhibits of the United States or any other nation; proceeding in another direction, he may examine successively all the exhibits from the different countries of one general class, such as agriculture, electricity, etc. But where it is not practicable, in arranging the exposition, to consider both the nature of the products and their place of origin, the grouping will follow the nature, the destination, and utility of the objects, rather than the country of production.

Under this plan, the different varieties of machinery

THE CENTENNIAL JUBILEE OF THE HIGH HAT.

IN these times, when we hear so much of jubilees, it is impossible to pass over the hundredth anniversary of the high hat—that indispensable article of men's wearing apparel—in silence; for if it is awarded no fete with ringing of bells and music, it deserves, at least, to have its history related. It seems to be remarkably tenacious of life and, in spite of having been condemned many times by its wearers as uncomfortable and inconvenient, of having been ridiculed and abused—we recall, for example, the derisive terms stovepipe, chimney pot, plug, tile, etc.—it still reigns supreme and its use becomes more and more universal. Even its worst traducers cannot dispense with it, for in England, France, Italy, Belgium, Spain, and in most other countries, especially where the Roman element prevails, everyone who wishes to be considered a reputable man must wear the high hat. At present it does not usually constitute a part of the everyday costume, but is indispensable for special occasions, such as calls, weddings, funerals, receptions, etc.

Opinions as to the time of the introduction of the high hat vary. In England, January 17, 1797, is said positively to be the day on which it first appeared, and therefore, in a certain sense, its birthday; for on that day a London hatmaker, who wished to bring his work before the public, first showed himself on the street in a high hat, and thereby caused such a crowd to gather that he was justly punished for creating a public disturbance. In Paris, however, they celebrated the centennial of the high hat last year, claiming that it was first seen there in the autumn of 1796, when it was worn by the fashion setting "Incroyables;" and a picture painted by Charles Vernet, called "An Incroyable of 1796," in which one of these rulers of fashion is represented as proudly wearing the new high hat, seems to prove this statement. Both of these theories as to the origin of the high hat are probably correct, for if it appeared in Paris in the fall of 1796, several months might easily have passed before it made its way to London. The real inventor of the high hat is not known; no newspaper nor chronicle mentions him, but he must have been a man gifted with a bold imagination, for the original form of the hat was very peculiar. The crown was high and broader at the top than at the bottom, while the sides of the broad brim were turned up so that they resembled the wings of a bird that is learning to fly. This brim disappeared almost entirely in the first year, however, and the crown became smaller and was encircled by a rather wide band held by a buckle. In 1802 both the crown and brim were broadened; in 1803 the latter was bent upward; while in 1804, when the declaration of independence in Haiti attracted attention to America, the American hat with broad brim turned up at the sides and bent in at the front became the fashion. Later the soft beaver hat was much worn; it had a high crown and the brim was bent up slightly at the sides and down in front. In 1810 the high hat bore a strong resemblance to the military hat, the brim was bent down to form a visor—an evidence of the military spirit which affected everything in Napoleon's time. The crown of the hat did not long remain so large and the brim arched more and more at the sides, but was bent down at the front and back; then it rose again gradually and became narrower until 1815, when it had almost entirely disappeared and the high hat resembled a Cossack cap. During the First Empire the high hat had the honor of being worn by the fair sex, as a part of both the riding and the promenade costume. In the former case it was very simple, without any trimming, and was provided with a band that passed under the chin; but for elegant toilets it was provided with a bunch of feathers,

THE CENTENNIAL JUBILEE OF THE HIGH HAT.

flowers or bows. About 1820 a cylindrical crown and broad brim were substituted for the so-called calash shape. From 1820 to 1823 enormously high hats were worn, the crowns of which were shaped almost like a cork that is much wider at the top than the bottom, while the brim was of greater or less width and was sometimes bent down and sometimes turned up; the material was generally long-haired beaver and the band was rather broad.

The silk hat dates from the beginning of the century and was patented in 1803 by its inventor, an Englishman named John Wilcox, who lived in Bordeaux; but the material used at that time was more like long napped plush. For a long time the invention met with little approbation, but finally, in the early twenties, was accepted by the fashionable world. It was much the same with the crush hat, which was first manufactured in England in 1824, but not until ten years later was this ingenious invention perfected by the Parisian hatmaker, Gibus. After the revolution of July the high hat had the form of a straight tube with broad, curved brim; then it changed and the crown was made smaller and cone shaped at the top, the brim being very narrow, as shown in the figure dated 1836. About 1840 the gray felt hat with broad, slightly curved brim was considered the non plus ultra of fashion, but the black hats held their own and were even worn as part of the hunting costume, for which purpose, however, they were made of palm fiber, like the Panama hats. The broad, slightly curved brim was retained until 1848; in the fifties it was gracefully turned up at the sides. In 1864 a hat with an enormously high crown, small at the top and a very narrow band, was fashionable. In 1878 the shape of the hat was graceful for the first time, the crown being lower and the brim, which was of medium width, slightly curved. In 1878 the crown was made higher, only to return again to the more moderate shape of 1870. From 1891 to 1895 the crown of the hat became lower and lower, but in 1896 the height began to increase and the narrow brim was curved gracefully at the sides.

On the whole we must acknowledge that the high hat has gained in lightness, elegance and becomingness, and can no longer be compared with the monster of 1796 nor the awkward beaver hat of our fathers. The gray high hat that was formerly considered a necessity for an English lord has become extinct. Only the shining silk hat still reigns supreme. It is still worn by ladies when riding. For the last fifty years it has had to compete with the low broad brimmed felt hat in its many forms, but has triumphed over its rivals; in fact, it might be said to have grown in favor lately, and to judge by present appearances, it will not lose its supremacy in the next hundred years. A celebrated French author says, "The world may perish, but the high hat never!"—Illustrirte Zeitung.

THE BERLINER TRANSMITTER PATENT.*

Full text of the decision of the Supreme Court of the United States in the matter of the United States, Appellant, v. The American Bell Telephone Company and Emile Berliner: Appeal from the United States Circuit Court of Appeals for the First Circuit. No. 344. October term, 1896. [May 10, 1897.]

On February 1, 1893, the United States filed in the Circuit Court of the United States in and for the District of Massachusetts a bill in equity against the American Bell Telephone Company and Emile Berliner, praying a decree to set aside and cancel patent No. 463,569, issued on November 17, 1891, to the telephone company, as assignee of Berliner. Upon amended pleadings and proofs the Circuit Court on January 3, 1895, (65 Fed. Rep. 86,) entered a decree as prayed for. On appeal to the Court of Appeals for the First Circuit this decree was on May 18, 1895, reversed, and a decree entered directing a dismissal of the bill. (33 U. S. App. 236.) Thereupon the United States took an appeal to this court. A motion was made to dismiss the appeal for want of jurisdiction, which was denied (159 U. S. 548), and the case was argued upon the merits.

As stated by counsel for the appellant, four grounds for relief were presented and discussed in the Circuit Court. Those grounds are:

"1. That the delay of the application in the office for thirteen years was, under the circumstances alleged in the bill, unlawful and fraudulent.

"2. That a patent, issued November 2, 1880, upon a division of the original application, covers the same invention as that covered by the patent in suit, an I exhausted the power of the Commissioner as to that invention.

"3. That the patent is not for the same invention which was described in the application as filed.

"4. That, taking the application to date from the time when it was made by amendment to cover the invention described and claimed in the patent as issued, it was barred by public use for more than two years."

By that court only the first two were considered, and the argument in the Court of Appeals was confined to those questions.

Justice Brewer delivered the opinion of the Court.

This is a suit by the United States to set aside a patent for an invention as wrongfully issued. It is, we believe, the first case in this court in which upon proofs such an application has been presented. The right of the United States to maintain such a suit was affirmed in the United States v. Telephone Company (124 U. S. 315). The question now is whether upon the facts disclosed in this record the relief prayed for ought to be awarded. It becomes, therefore, a matter of moment to determine under what circumstances and upon what conditions the United States are entitled to have a patent issued in due course of law set aside and canceled.

Many cases have come to this court in which patents for lands have been sought to be set aside, and the rules controlling such suits have been frequently considered. Such decisions will naturally throw light upon the question here presented, though before adverting to them it may be well to note the difference between patents for land and patents for inventions. While the same term is used, the same grantor is in each, and, although each vests in the patentee certain rights, yet they are not in all things alike. The patent for land is a conveyance to an individual of that which is the absolute property of the government and to which, but for the conveyance, the individual would have no right or title. It is a transfer of tangible property; of property in existence before the right is conveyed; of property which the government has the full right to dispose of as it sees fit, and may retain to itself or convey to one individual or another; and it creates a title which lasts for all time. On the other hand, the patent for an invention is not a conveyance of something which the government owns. It does not convey that which, but for the conveyance, the government could use and dispose of as it sees fit, and to which no one save the government has any right or title except for the conveyance. But for the patent the thing patented is open to the use of any one. Were it not for this patent any one would have the right to manufacture and use the Berliner transmitter. It was not something which belonged to the government before Berliner invented it. It was open to the manufacture and use of any one, and any one who knew how could contrive, manufacture and use the instrument. It conveyed to Berliner, so far as respects rights in the instrument itself, nothing that he did not have theretofore. The only effect of it was to restrain others from manufacturing and using that which he invented. After his invention he could have kept the discovery secret to himself. He need not have disclosed it to any one. But in order to induce him to make that invention public, to give all a share in the benefits resulting from such an invention, Congress, by its legislation, made in pursuance of the Constitution, has guaranteed to him an exclusive right to it for a limited time; and the purpose of the patent is to protect him in this monopoly, not to give him a use which, save for the patent, he did not have before, but only to separate to him an exclusive use. The government parted with nothing by the patent. It lost no property. Its possessions were not diminished. The patentee, so far as a personal use is concerned, received nothing which he did not have without the patent, and the monopoly which he did receive was only for a few years. So the government may well insist that it has higher rights in a suit to set aside a patent for land than it has in a suit to set aside a patent for an invention. There are weightier reasons why the government should not be permanently deprived of its property through fraudulent representations or other wrongful means, than there are for questioning the validity of a temporary monopoly or depriving an individual of the exclusive use for a limited time of that whose actual use he claims to have made possible, and which, after such time, will be open and free to all. Bearing in mind this distinction, let us inquire upon what conditions the government may maintain a suit to set aside a patent for land.

These suits may be conveniently grouped in three classes: First, where, the government being the only party interested, the patent is charged to have been obtained by fraud in representations or conduct. Second, where the land by appropria'e reservation is not subject to patent, but is, nevertheless, erroneously patented. Third, where the land, though subject to patent in the ordinary administration of the land office, is patented to the wrong person either through fraud or by reason of mistake or inadvertence. In the first class are the following cases: United States v. Hughes, (11 How. 552;) United States v. Throckmorton, (98 U. S. 61;) United States v. Atherton, (102 U. S. 372;) Moffat v. United States, (112 U. S. 24;) United States v. Minor, (114 U. S. 233;) Maxwell Land Grant Case, (121 U. S. 325;) Colorado Coal Co. v. United States, (123 U. S. 307;) United States v. San Jacinto Tin Co., (125 U. S. 273;) United States v. Silver Mining Co., (128 U. S. 673;) United States v. Hancock, (133 U. S. 193;) United States v. Trinidad Coal Co., (137 U. S. 160;) United States v. Budd, (144 U. S. 154;) San Pedro &c. Co. v. United States (146 U. S. 120). In the second are these: United States v. Stone, (2 Wall 525;) Leavenworth &c. R. R. Co. v. United States, (92 U. S. 733;) McLaughlin v. United States, (108 U. S. 526;) Western Pacific R. R. Co. v. United States, (108 U. S. 510;) Mullan v. United States, (118 U. S. 271;) and in the third the following: Hughes v. United States, (4 Wall, 232;) United States v. Beebe, (127 U. S. 338;) United States v. Marshall Mining Co., (129 U. S. 579;) United States v. Missouri &c. Railway, (141 U. S. 358;) United States v. Southern Pacific R. R. Co., (146 U. S. 570.)

The second and third classes are not paralleled in this case, for it is not claimed that there was no invention, or that the patent issued to the wrong party. The decisions in those classes need not be considered. The first class comprises all cases in which the land, though subject to patent and therefore within the jurisdiction of the land department, was charged to have been patented in consequence of fraudulent representations or conduct on the part of the patentee. The representations may have been as to the matter of right or the matter of quantity. The patentee may have been entitled to no land, or to less, or a different tract than that patented. In any event, fraud was the basis of the relief sought, and as fraud actual or constructive in the issue of the patent is the burden of this suit, we will quote from the opinions in some of these cases. In the Maxwell Land Grant case, Mr. Justice Miller, delivering the opinion of the court, said (page 381):

"We take the general doctrine to be, that when in a court of equity it is proposed to set aside, to annul or to correct a written instrument for fraud or mistake in the execution of the instrument itself, the testimony on which this is done must be clear, unequivocal and convincing, and that it cannot be done upon a bare preponderance of evidence which leaves the issue in doubt. If the proposition, as thus laid down in the cases cited, is sound in regard to the ordinary contracts of private individuals, how much more should it be observed where the attempt is to annul the grants, the patents, and other solemn evidences of title emanating from the Government of the United States under its official seal. In this class of cases the respect due to a patent, the presumption that all the preceding steps required by the law had been observed before its issue, the immense importance and necessity of the stability of titles dependent upon these official instruments, demand that the effort to set them aside, to annul them, or to correct mistakes in them should only be successful when the allegations on which this is attempted are clearly stated and fully sustained by proof. It is not to be admitted that the titles by which so much property in this country and so many rights are held, purporting to emanate from the authoritative action of the officers of the Government, and, as in this case, under the seal and signature of the President of the United States himself, shall be dependent upon the hazard of successful resistance to the whims and caprices of every person who chooses to attack them in a court of justice; but it should be well understood that only that class of evidence which commands respect, and that amount of it which produces conviction, shall make such an attempt successful."

In Colorado Coal Co. v. United States, Mr. Justice Matthews, after quoting part of the foregoing, adds (page 317):

"It thus appears that the title of the defendants rests upon the strongest presumptions of fact, which, although they may be rebutted, nevertheless can be overthrown only by full proofs to the contrary, clear, convincing and unambiguous. The burden of producing these proofs and establishing the conclusion to which they are directed rests upon the Government. Neither is it relieved of this obligation by the negative nature of the proposition it is bound to establish. It is, indeed, sometimes said that a negative is incapable of proof, but this is not a maxim of the law. In the language of an eminent text writer: 'When the negative ceases to be a simple one—when it is qualified by time, place or circumstance—much of this objection is removed; and proof of a negative may very reasonably be required when the qualifying circumstances are the direct matter in issue, or the affirmative is either probable in itself, or supported by a presumption, or peculiar means of proof are in the hands of the party asserting the negative.'"

Then, after quotations from many authorities, the learned Justice closes the discussion with these words from 1 Greenleaf on Ev., sec. 80:

"So, where the negative allegation involves a charge of criminal neglect of duty, whether official or otherwise; or fraud; or the wrongful violation of actual lawful possession of property; the party making the allegation must prove it; for in these cases the presumption of law, which is always in favor of innocence and quiet possession, is in favor of the party charged."

In United States v. Marshall Mining Company, Mr. Justice Miller again refers to this matter, saying (page 589):

"The dignity and character of a patent from the United States is such that the holder of it cannot be called upon to prove that everything has been done that is usual in the proceedings had in the land department before its issue, nor can he be called upon to explain every irregularity or even impropriety in the process by which the patent is procured."

With these declarations of the law controlling such cases we proceed to consider that which, according to the brief of counsel for the Government, is the principal matter in this case. We quote their words:

"The delay in the office is the great fact in the case. It determined the bringing of the suit, stands in the forefront of the bill, was the principal question argued in both courts below, and occupies the chief space in the decisions rendered. It is not set up as laches, nor as a ground of forfeiture under any provision of the law or rule of the Patent Office, but as a course of conduct in the nature of fraud on the public."

What was the delay in this case? The application by Berliner was made on June 4, 1877, he having filed a caveat on April 14, 1877. In 1878, and prior to October 23, the telephone company purchased Berliner's invention, and on November 17, 1891, a patent was issued to the telephone company, as assignee of Berliner. The application was, therefore, pending in the department fourteen years, during thirteen of which the invention was the property of the telephone company. The effect of this, it is said, is to prolong for all practical purposes the telephone monopoly during the lifetime of this patent; and in this way: On March 7, 1876, patent No. 174,465 was issued to Alexander Graham Bell, in which patent, as alleged in the bill and admitted in the answer, were described and claimed "a method of and apparatus for transmitting sound by means of an undulatory current of electricity." This was the original telephone patent. And it signified that Bell invented the telephone. That patent has expired and all the monopoly which attaches to it alone has ceased, and the right to use that invention has become public property. But while he invented the telephone, the apparatus he devised was inefficient for public uses. Berliner invented something by which, taken in connection with Edison's and Blake's inventions, Bell's undulatory current could be made practically available for carrying on conversation at long distances. In other words, the telephone, as we use it—that which has become such an important factor in the commercial and social life of to-day—does not embody simply the invention of Bell, but also those of Edison, Blake and Berliner. So that while the public has to-day, by reason of the expiration of the Bell patent, the right to use as it pleases his invention, such right is a barren one, and the telephone monopoly is practically extended to the termination of the Berliner patent. And this extension of the time of the monopoly has been accomplished by means of the delay in the issue of the Berliner patent, the long pendency of the application in the Patent Office. In order that the contention of the Government may be clearly presented, and in view of the importance of this question, we may properly quote at some length from the brief of counsel:

"In the present case Mr. Bell's patent of 1876 covered broadly the process of transmitting sound by means of an undulatory electric current, as distinguished from an interrupted or broken current, no matter how produced. His patent showed a transmitter capable of producing such a current, but so feebly that its use was limited to short distances. Afterward Mr. Berliner discovered, we will say, that the undulatory current necessary to transmit speech can be produced by means of another form of transmitter—one operating by variation of pressure between its electrodes at their point of contact. But as the only function of the instrument was to produce an undulatory current, and as the use of that current, however produced, was covered by Mr. Bell's invention, it follows that the instrument was subject to two independent monopolies.

"Later we will say Mr. Edison discovered that the use of carbon as the material for the construction of the

* For the copy of this important decision we are indebted to Mr. Justice Brewer.—EDS.

electrodes of the Berliner transmitter gave to that instrument a greatly increased power and reach of operation. Later still Mr. Blake devised a particular combination of carbon and metallic electrodes, with mechanism for their mounting, which secured an improved ease and permanence of adjustment and superior adaptation to common use. Mr. Bell hit upon the true principle, in relation to the kind of current to be employed, and was justly entitled to a patent for it, although the range of his transmitter may have been but a few hundred feet. Mr. Berliner, we will say, hit upon the true principle underlying the operation of the microphone, and was entitled to his patent, although the mechanism he used in the embodiment of his thought was so unstable in its adjustment as to make it of uncertain value. The inventions of Mr. Edison and Mr. Blake completed the instrument, and made possible the talking telephone in every man's house, the city exchange, and the long distance line from city to city.

"It thus happened that the Blake transmitter introduced into public use by the Bell Company in 1878, and familiar to us all, was the embodiment in one piece of mechanism and its use of four distinct inventions made by four different men. That company was the owner of all the inventions. For Mr. Bell's invention it held patents issued in 1876 and 1877; for Mr. Blake's, patents were issued in 1881; and for the others, applications were on file subject to its control.

"Mr. Bell's invention was one of the first rank—nothing less than the discovery of a new law of nature. Mr. Berliner's invention was a beautiful intellectual conception of a mode of operation. Mr. Edison's was the discovery of a new property of carbon. Mr. Blake's was an ingenious and a practical utilization of the three. Mr. Bell's invention lies at the foundation of the art of telephony. Mr. Edison's and Mr. Blake's have done more to make the art of practical value than all others following Mr. Bell.

"We assume that it was not possible to take out patents for all these inventions at the same time. And so far as that was not possible, the overlapping and prolongation of the monopolies created by the patents in the use of the carbon microphone could not be avoided without denying to some one or more of the inventors his rights under the law. But does it follow that the Bell Company was entitled of right to hold control of the microphone under the broad claims of the Bell patent and the construction and combination claims of the Blake patents and nurse the applications for the other inventions in the office, taking out a patent on Berliner's just in time to overlap Bell's, and on Edison's in time to overlap Berliner, and so secure a monopoly on the same transmitter used in the same way to produce the same result for three times the period fixed by the statute for the duration of a patent?

"It needs no lawyer's argument to make manifest the inherent moral wrongfulness of such a proceeding toward the public. Every right-minded man will feel it instinctively. Would it be a legal wrong?"

After discussing the injury to the public which results from the conduct described, they add:

"Hence a man who is enjoying a monopoly of a thing under one patent, and is at the same time prosecuting an application for another patent which will give him a monopoly of the same thing for a further period, is bound to speed his application."

It will be perceived that it is conceded that some delay is unavoidable. In the very nature of things that is so. It is not possible that an application for a patent can be considered and determined on the instant. So it is not the fact, but the excessiveness of the delay of which complaint is made. The mere fact of delay does not, therefore, operate to deprive the inventor of his legal rights. Before he can be punished it must be shown that he has been guilty of a wrong—that he has caused the delay. It matters not whether the delay be reasonable or unreasonable, for a brief time or for many years, if the applicant is not responsible for it. Whatever may be the injury to the public, if the delay is caused solely through the negligence or inattention of the tribunal before which the application is pending, it is something for which the applicant is not responsible, and which does not affect his legal rights. There is often great delay in suits in the courts. Cases not infrequently are argued before the highest courts and not decided by them for weeks and sometimes for years. Whatever effect such delay may have upon the interests of others or of the public, so long as it results from the mere non-action of the courts, the rights of the suitor are unaffected. He cannot be punished on account of the delay of the tribunal before which he is presenting his suit.

Neither can a party pursuing a strictly legal remedy be adjudged in the wrong if he acts within the time allowed, and pursues the method prescribed by the statute. If the statute gives him five years within which to bring an action on a note he cannot be denied relief simply because he waits four years and eleven months. If he has two years after a judgment against him within which to take an appeal, he may wait until the last day of the two years. Under section 4886, Rev. Stats., an inventor has two years from the time his invention is disclosed to the public within which to make his application, and unless an abandonment is shown during that time he is entitled to a patent, and the patent runs as any other patent for seventeen years from its date. He cannot be deprived of this right by proof that if he had filed his application immediately after the invention the patent would have been issued two years earlier than it was, and the public therefore would have come into possession of the free use of the invention two years sooner. The statute has given this right, and no consideration of public benefit can take it from him. His right exists because Congress has declared that it should. It will not do to say that, because Congress has declared that seventeen years is the life of a patent, seventeen years is the limit of the possible monopoly; for the same legislation that gives seventeen years as the life of a patent gives two years within which an application for a patent may be made, and during that time, as well as while the application is pending in the department, the applicant has practically, if not legally, an exclusive use. A party seeking a right under the patent statutes may avail himself of all their provisions, and the courts may not deny him the benefit of a single one. These are questions not of natural but of purely statutory right. Congress, instead of fixing seventeen, had the power to fix thirty years as the life of a patent. No court can disregard any statutory provisions in respect to these matters on the ground that in its judgment they are unwise or prejudicial to the interests of the public.

And in this connection it is also well to notice these facts: Sec. 4888, Rev. Stat., requires an inventor to make application in writing to the Commissioner of Patents. That and the two or three succeeding sections prescribe what the application shall state, and by what it shall be accompanied. Section 4893 provides that on the filing of the application and the payment of fees "the Commissioner of Patents shall cause an examination to be made of the alleged new invention or discovery; and if on such examination it shall appear that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the Commissioner shall issue a patent therefor." Section 4894 reads:

"All applications for patents shall be completed and prepared for examination within two years after the filing of the application, and in default thereof, or upon failure of the applicant to prosecute the same within two years after any action therein, of which notice shall have been given to the applicant, they shall be regarded as abandoned by the parties thereto, unless it be shown to the satisfaction of the Commissioner of Patents that such delay was unavoidable."

Certain rules of procedure have been prescribed by the Commissioner of Patents, and a certain routine of practice has become established in that department. Now, all these matters of statutory enactment, rules of procedure and routine of practice, are things over which an applicant has no control. When he has once filed his application, complying with the statutory requirements, then the Patent Office takes possession of the matter. It determines when and how it will act, and the applicant can only ask and wait.

And why should he be called upon to do more? He comes before the tribunal which the Government has established and presents his application. Why should the validity of the grant which that tribunal finally makes depend in any degree upon the number of times he has repeated his application? The true rule is that if application has been made and the applicant has once called for action, he cannot be deprived of any benefits which flow from the ultimate action of the tribunal, although that tribunal may unnecessarily, negligently, or even wantonly, if that supposition were admissible, delay its judgment. If the public is interested in prompt action, if the Government which represents the public thinks that more speed on the part of any of its tribunals is essential, it is the Government which is called upon to act, and the applicant may with propriety wait until either the tribunal has acted or until the Government, having regard for the public interest, has interfered to compel action. Accepting the statement of counsel as to the facts to be correct in all its fullness, consider what would have been the ruling of a court if an application had been made to it based upon those facts. Suppose the applicant had presented its petition for a mandamus to compel prompt action on the part of the patent officials and said, "I have applied for and am entitled to a patent. It will be issued after awhile without any judicial compulsion. I can make large profits if the Patent Office will be dilatory, and yet I ask a mandamus to compel its immediate action," would not the ruling have been, "By your own showing you are entitled to no relief; you have no cause of complaint; it is the Government, representing the public, which alone can complain." And if it could obtain no assistance by a suit in advance, can it be punished indirectly by being deprived of that which was finally awarded to it?

Much is said in the briefs and in the arguments about the practical continuance of the telephone monopoly. It is well to understand exactly what is meant thereby. No one questions that the Bell patent has expired, and that all of his invention is free to the use of the public. It is not denied that Berliner's invention is something independent and distinct from the Bell invention. It is the combination of these inventions with those of Blake and Edison which make the instrument in commercial use, and because this is the most serviceable it is the one that the public insists upon having. But each invention has independent rights. It loses nothing because when united with another it results in an instrument more valuable than either alone will give. Suppose that at the expiration of this Berliner patent some new invention shall be made by which in connection with those already free to the public an instrument can be manufactured far surpassing in utility that used to-day, and the Bell Company shall purchase that invention, the public, which always insists on having the best and most serviceable, will undoubtedly take the new instrument, and in that way it may happen that what is called the telephone monopoly is practically still further continued. But surely that does not abridge the legal rights of any one. The inventor of the latest addition is entitled to full protection, and if the telephone company buys that invention, it is entitled to all the rights which the inventor had. All that the patent law requires is that when a patent expires the invention covered by that patent shall be free to every one, and not that the public has the right to the use of any other invention, the patent for which has not expired, and which adds to the utility and advantage of the instrument made as the result of the combined inventions.

Counsel seem to argue that one who has made an invention and thereupon applies for a patent therefor occupies, as it were, the position of a quasi trustee for the public; that he is under a sort of moral obligation to see that the public acquires the right to the free use of that invention as soon as is conveniently possible. We dissent entirely from the thought thus urged. The inventor is one who has discovered something of value. It is his absolute property. He may withhold the knowledge of it from the public, and he may insist upon all the advantages and benefits which the statute promises to him who discloses to the public his invention. He does not make the law. He does not determine the measure of his rights. The legislative body, representing the people, has declared what the public will give for the free use of that invention. He cannot be heard in the courts to say that it is of such value that he is entitled to a larger and longer monopoly; that he is not fully compensated for the great benefit which his invention has bestowed by the pecuniary receipts during seventeen years. No representative of the public is at liberty to negotiate with him for a new and independent contract as to the terms and conditions upon which he will give up his invention. He must come under the dominion of the statute, and take that which the public has proffered its willingness to give. As the lawmaking power has prescribed what the public will give, specified the terms and conditions of purchase, indicated the time and methods of determining the right of compensation, he on his part has an absolute legal right to avail himself of all the provisions thus made. It is not of course doubted that the courts in construing the patent as all other statutes must have regard to the spirit as well as the letter. That simply requires that courts shall ascertain their true meaning, but when that is ascertained the applicant for a patent is entitled to all the benefits which those statutes thus construed give.

What are the evidences of wrong in this matter of delay? It may have been caused either by the negligent or wrongful action of the officers of the department, and without any connivance, assistance or concurrence on the part of the applicant, or it may have been brought about by the applicant, either through its corruption of the public officers, or through other misconduct on its part. If the fault is wholly that of the department, the applicant ought not to suffer therefor. While, on the other hand, if its conduct has been wrongful, it may and ought to suffer. There is no presumption against the applicant. If a tribunal charged with official action delays such action, whatever of presumption surrounds the delay attaches to the tribunal, and no evidence of wrong being given, the presumption would be that the delay was at the instance of the tribunal, and not caused by the applicant. The government, therefore, in order to make out its case, must affirmatively show that the delay has been caused in some way by the conduct of the applicant, and before its patent can be set aside the government must, in accordance with the rules laid down in respect to land patents, establish that fact clearly. It may not rest on mere inferences, mere suggestions, but must prove the wrong in such a manner as to satisfy the judgment before it can destroy that which its own agents have created. We reiterate what was said by Mr. Justice Miller, for the court, in the Maxwell Land Grant case, that a suit between individuals to set aside an instrument for fraud can only be sustained when the testimony in respect to the fraud is clear, unequivocal and convincing, and cannot be done upon a bare preponderance of evidence which leaves the issue in doubt; and that if this be the settled rule in respect to suits between individuals, it is much more so when the government attempts to set aside its solemn patent. And we may here again repeat that, if this is true when the suit is to set aside a patent for land, which conveys for all time the title, a fortiori it must be true when the suit is one to set aside a patent for an invention which only grants a temporary right.

What evidence has the government produced? We premise by saying that there is not a scintilla of testimony as to any corruption of the officers of the department by the defendants, or any attempt at such corruption. Counsel do not put the finger on a single fact tending to show that any money was ever paid to any official of the Patent Office, or that any undue influence was ever attempted to be exerted upon or improper suggestion made to any one. So far as the record discloses, there never was an intimation made to a single official that he could profit in any way by a moment's delay. All thought of wrong in this respect may, therefore, be put aside. If there was no corruption on the part of the defendants, what did they do that calls for condemnation? And we turn to the brief of the learned counsel for the Government to see what evidences of wrong they have found in the record. After noting that their inquiry begins at June 9, 1882, thus impliedly conceding that there is no reason to question the delay up to that time, (a period of five years,) they call attention to the subsequent correspondence between the solicitor in charge of the application and the officials of the department, which, so far as is material, is as follows:

"On June 9, 1882, the examiner wrote to the solicitor as follows:

> 'As at present advised it is believed that the claims presented may be allowed, but final action in this case must be suspended in view of probable interferences with other pending applications, which will be declared as soon as practicable.'

"On October 8, 1883, sixteen months later, the solicitor wrote as follows:

> 'In June, 1882, I received an official letter dated the 9th of that month, saying that "the claims presented may be allowed, but final action is suspended in view of probable interferences." Since then I have been awaiting the official action. I beg to call attention to the case and ask that it may receive action.'

"October 23, 1883, the examiner, as follows:

> 'In response to applicant's letter filed October 9, 1883, it is stated that further action in this case on the part of the office must be still further postponed until the conditions of interfering applications will permit the declaration of interference, which seems unavoidable.'

"On February 19, 1886, two years and four months later, the solicitor, as follows:

> 'The specification is hereby amended as follows: Erase amendment O, filed December 16, 1881. Erase claims 3, 7, 8, 10, and 11, and change number of claims 4, 5, 6, 7, and 9 to 3, 4, 5, 6 and 76.'

"This amendment contained nothing material to the present discussion.

"March 17, 1886, the examiner, as follows:

> 'In response to amendment of February 19, 1886, applicant is advised that the broad claims involving the idea of a variable pressure contact telephone will probably be involved in an interference with a pending application or applications of another applicant, and that said applicant has been advised that he must show that the office action taken in the matter of his application is not a sufficient answer thereto on or before the 1st of April, 1886. In the meanwhile this application will be suspended from further action.'

"August 13, 1886, five months later, the solicitor:

> 'I desire to be informed of the present status of

this case, and to be advised if the office is awaiting any action on the part of the applicant. It is desired that no rights should be lost by inaction."

"August 19, 1886, the examiner, as follows:

'In response to applicant's letter of the 13th inst, he is hereby advised that the delay in this case is a matter over which he has no control, except it be, perhaps, in the matter of urging an early interference. The interference will be declared as soon as the other applicants are in condition, if it be decided that they are entitled to the same. The office is awaiting no action on the part of the applicant, and the delay is through no fault of his.'"

After these quotations, counsel observe as follows:

"These perfunctory exchanges of compliments between the solicitor and the examiner occupied the entire time from June 9, 1882, to March 16, 1888, five years nine months and seven days. In all that time not a demand for action, not a hint even of dissatisfaction, appears in the record. We have quoted it all. Of course, this appearance of willing acquiescence is not conclusive. The examiner's letters indicate an obstacle in the way; some portending interference or interferences, always coming, yet never arriving. But the supine submission of the company to such extraordinary delay, for such a cause, is the first item of the proof. If it had been possessed of a real purpose to have its patent as soon as possible, if it had been losing millions per annum for want of it, as the people are losing millions because of it, would it not have found some way to force this invisible foe into the field, or at least leave on the record some trace of its mighty effort to burst the bands of official routine which prevented it from finding and fighting him?"

This presents the burden of the case on the part of the government. It amounts to only this: The defendant company was not active, but passive. If millions were to be added to its profit by active effort, it would have been importunate and have secured this patent long before it did. As millions came to it by reason of its being passive, it ought to suffer for its omission to be importunate. It must keep coming before the commissioner, like the widow before the unjust judge in the parable, until it compels the declaration, "though I fear not God nor regard man, yet, because this widow troubleth me, I will avenge her, lest by her continual coming she weary me." But is this the rule to measure the conduct of those who apply for official action? What is the amount of the importunity which will afford protection to the grant finally obtained? How frequent must the demand be? It is easy to say that the applications of this defendant, coming only at the interval of months and years, were, taken with the replies of the Patent Office, mere "perfunctory exchanges of compliments," but this does not change the fact that action was asked and repeatedly asked; that no request was made for delay, no intimation that it was desired or would be acceptable.

In this connection may well be noticed the letter of the solicitor, in March, 1881, to the Commissioner, in which he urged the modification of Rule No. 94 in respect to interferences, and this in order to hasten the issue of the patent. In this letter, besides pointing out how the rule as it then existed would tend to delay, he adds these statements:

"So far as my client is concerned, I have to submit that it is of the utmost importance that the interference be declared forthwith. . . .

"The indefinite suspension of the interference would only create harassing and oppressive claims after the public had become possessed of the invention without hindrance or objection on the part of the inventor, and it is but just to say that neither of the interfering applicants could with any degree of propriety claim to be the inventor and expect that such notice on his part would be treated by the public with any degree of respect. Patents issued as the result of long pending interferences are always looked upon as odious monopolies, because of the manner in which they are enforced at the time when the public were already possessed of the invention. . . .

". . . An early decision upon the question submitted is earnestly requested."

It may be added that the modification was made in October, 1881.

In respect to this letter, and especially the second paragraph, quoted above, counsel for the government say:

"In the argument below, counsel appeared to think that once was enough, and that they stood as a perpetual exhortation to duty to the examiner and all his successors as though they had been nailed on his office door. But they were not even in the file of the Berliner case. Examiner Freeman, whose report was indorsed on the letter, went out of office in 1883. If any one ever saw it after that until it was exhumed for the purpose of this case, the fact does not appear in the record."

But is the applicant to be condemned because, having once made an urgent request for action and pointed out reasons therefor, it was not continually repeating that request, because it did not see that such request was placed on the files of this particular application, or, as intimated in the words of counsel, nailed on the doors of the Patent Office?

It is, of course, easy to say that these applications, these suggestions and requests meant nothing; that they were a mere blind; but something more than assertion of counsel is necessary to destroy their significance, or to establish collusion between the applicant and the officials of the department. But the case does not stand upon the fact that the formal communications from the solicitor in charge of this application were few in number. While in every one, in which the matter was referred to, there was a request for action, it also appears from the testimony of Messrs. Freeman, Lyons and Kintner, who were the examiners in charge during the major portion of the time in dispute, that the representatives of the Bell Company were urgent in pushing the Berliner application. For instance, Examiner Lyons testified:

"They were urgent and persistent beyond toleration. Hardly a day passed without somebody representing the interests of the Bell Telephone Company coming to our room and urging the allowance of the Berliner case or the declaration of interferences. I myself was waylaid in the halls of the Patent Office, and on more than one occasion did I sneak into the room to avoid being bored by Mr. Charlie Hedrick, the assistant of Mr. Pollock. Mr. Pollock himself, also, although less frequently, came to the room, and later on, notably toward the end of 1884, and in the spring and summer of 1885, Mr. W. W. Swan was a frequent visitor in the electrical division."

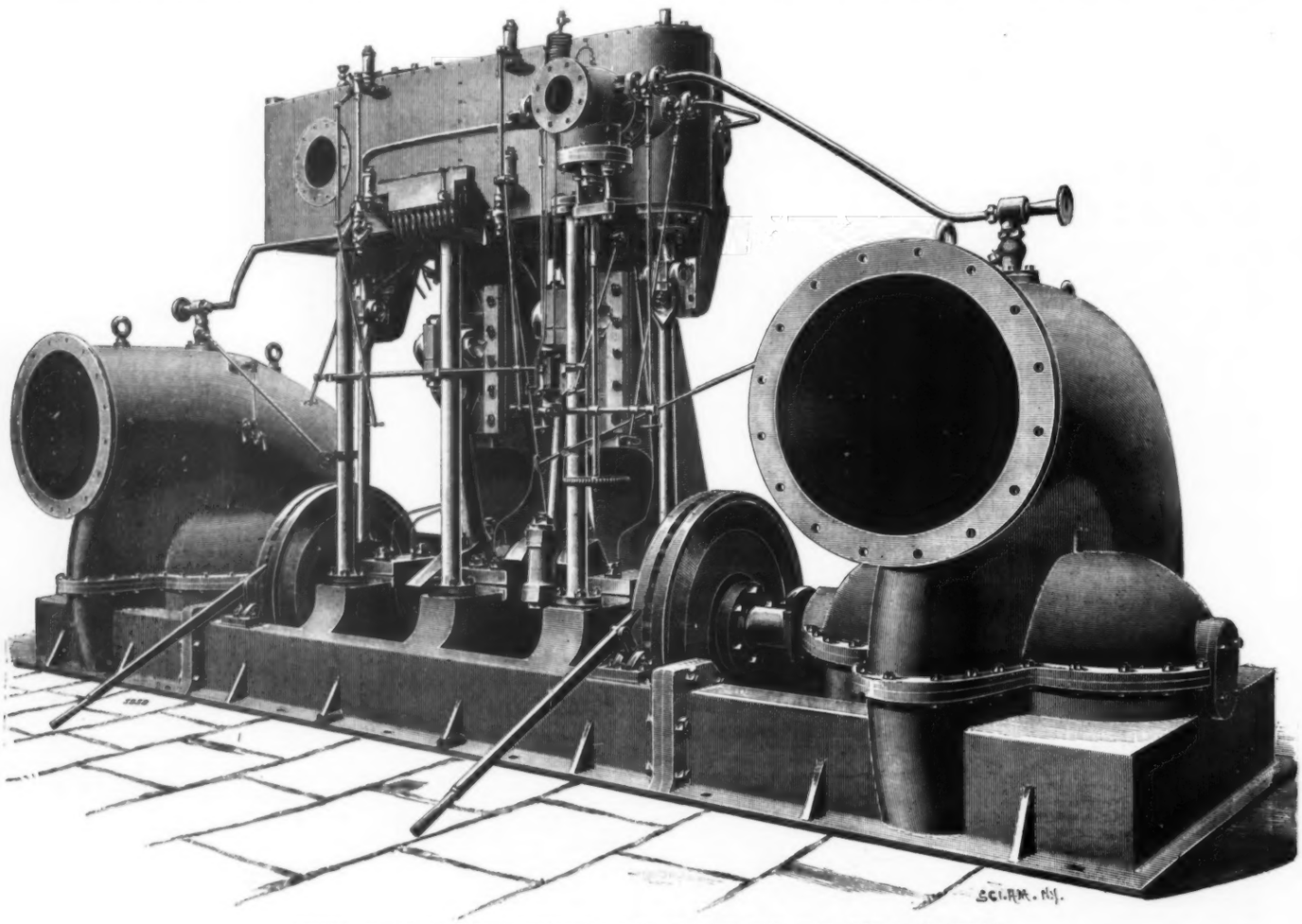
And Examiner Kintner (who was in office from May, 1883, to April, 1887), in reply to a question as to what Mr. Swan, one of the representatives of the telephone company, did in respect to the application, said:

"I had a great many interviews with him in the matter of both the Edison and the Berliner applications under consideration, and he was very persistent in urging the passage of both applications to patent; in fact, to such an extent that his persistency annoyed me not a little."

(To be continued.)

CENTRIFUGAL PUMPS FOR THE UNION DRY DOCKS, NEWPORT.

OWING to the increasing activity of the British shipbuilding industry, a great impetus has arisen round the coast in the construction of new docks. The importance of dry dock accommodation for the speedy execution of repairs, etc., cannot be overestimated, and the increase in the number of these docks in the neighborhood of Newport and Cardiff illustrates the immense expansion in this class of business. There are already a number in Newport, but the Union Dry Dock Company, Limited, has decided to build yet another on a very large scale. The pumping plant for this important dock has been designed and constructed by Messrs. W. H. Allen, Son & Company, of Bedford. As will be seen, instead of each pump being driven by its own engine, as is usual in dry dock pumping plants, in this case both pumps are driven by one compound engine of 550 indicated horse power, having cylinders 21 inches and 35 inches in diameter, and a stroke of 20 inches. The whole of the working parts are of Siemens-Martin steel, having a tensile strength between 34 and 36 tons, with an elongation of 27 per cent. in 2 inches. The crankshaft has a diameter of 7 inches, and is forged out of the solid ingot. The bearings are of bronze, lined with white metal. The pump shaft is of steel, incased with gun metal. In designing the engine great care has been taken to secure economy in the use of steam and to obtain easy running. The engine is arranged so that it can be worked as a simple engine, each half driving either pump. Special attention has been given to the lubricating arrangement, the whole supply being from one central reservoir,



CENTRIFUGAL PUMPING ENGINES FOR THE UNION DRY DOCK, NEWPORT.

while the handles for working all the various valves, drains, etc., have been brought to the center and are under easy control of the engineer in charge. The centrifugal pumps are of the well-known "Conqueror" type, each having discharge branches 36 inches in diameter. Each pump is capable of discharging 25,000 gallons of water per minute, working upon a varying lift of 30 feet at a speed of 100 revolutions per minute. —London Engineering.

ASPIRATORS AND SEPARATORS FOR THE DISPOSAL OF SHAVINGS.

ONE of the essential conditions for the proper operation of a shop in which woodworking machine tools

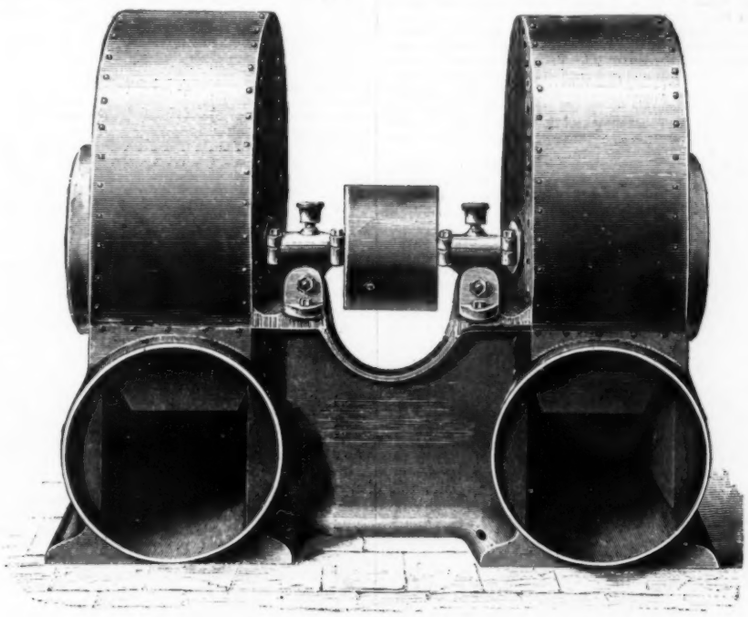


FIG. 1.—DOUBLE ASPIRATOR WITH STEEL PLATE SHELL.

are employed is that the fine dust in suspension in the atmosphere and the shavings and sawdust produced by the machines shall be removed as completely and cheaply as possible. In fact, on the one hand the dust, by entering the respiratory organs, becomes a source of considerable annoyance to, and often the cause of serious affections in, the workmen who run such machines, and on the other, the removal of the shavings and the carriage thereof to a building that is often distant is attended with expense, while the accumulation of them around the machines, where they become saturated with oil, greatly increases the risk of fire.

So, in recent years, the idea has occurred to produce a direct suction of the shavings and sawdust, in measure as they are produced, by means of powerful pneumatic apparatus that draw them into receptacles completely isolated from the main building, and which they reach in a dry and cool state, thus reducing the danger resulting from their being placed in piles.

We now propose to describe one of the apparatus employed and its mode of operation.

The first systems of suction apparatus employed were designed with a view to the removal of shavings and the transfer thereof to a store house; but such apparatus had one somewhat grave defect, namely, that the fine dust carried along by the current of air escaped in great part through the apertures in the storage place, covered the neighboring buildings, filled the gutters and consequently annoyed the neighborhood. In order to remedy this in a certain measure, one was led to increase the capacity of the store house to an unnecessary degree, and to establish two deposit chambers communicating through an aperture covered with wire gauze or hair cloth that arrested the greater part of the fine dust. But the gauze became easily choked up, and it was necessary to clean it very often by giving it a shaking. The result was a strong counter pressure upon the aspirator and an increase in the expenditure of motive power.

Mr. Kirchner has devised an arrangement that operates more perfectly and is less cumbersome. It consists in causing the shavings and sawdust to pass into a separator analogous to those that are used in flour mills, and in which the finest dust is condensed and falls to the lower part, while the air, completely freed therefrom, escapes externally through a chimney.

The aspirator may be simple or double, and with a cast iron or steel plate shell. In Fig. 1 we give a view of a double aspirator with a steel plate shell.

The aspirator is placed either in the basement or in the ceiling of the shop, and is connected with the machines by pipes and funnels.

The shavings, having passed through the fans of the aspirator, are carried by a conduit to the separator installed in the deposit chamber. Here the air, holding the shavings and sawdust in suspension, ascends a spiral that gives it a rapid rotary motion. All the solid particles separate and fall to the lower part, while the air rises in the chimney.

Fig. 2 represents the complete installation of a shop with an aspirator and separator for the removal and deposit elsewhere of the sawdust produced. The suction is produced under each machine with the aid of funnels. If it is desired to dispense with the use of the latter, apertures may be made in the floor, and into these the shavings may be swept from time to time. When not in use, the apertures may be closed with covers.—La Revue Technique.

COLLOID RELIEFS.

MAKING AND DIRECT PRINTING FROM COLLOID SURFACES.

By THOMAS BOLAS, F.C.S., F.I.C.

TO such of the present day workers as do not look beyond the day with its various balances of oversight and observation, this title will perhaps suggest that fish glue or enamel process in which the resist is often left upon the etched metal block so as to form the intermediate printing face; but in this instance the colloid facing of the etched block is more of the nature of an incident than an essential. I rather wish to say a few words as to those printing methods in which the colloid relief is the essential element of the printing surface, as in the case of Husnik's leimtype, or the stannotype of Woodbury, although in the latter case the colloid relief is covered or faced with tinfoil; which tinfoil is merely a protection against the chemical stress of printing, much in the same way as the steel facing of an intaglio plate is a protection against the mechanical stress of printing.

In Husnik's leimtype and in Woodbury's stannotype the printing surface is what is generally known as a carbon or autotype print; but a print with an extra high relief, to obtain which necessitates the use of a tissue prepared with not only an unusually thick layer of gelatine, but this gelatine must only be very slightly pigmented, or in some cases not pigmented at all.

The leimtype block, or gelatinotype, as it was known in 1887, when an example was issued with the Year Book of Photography for 1888, consisted of the stripped film of a thick carbon print; a grained negative having been used in making the print, and the film being mounted type high on a rigid block.

No detailed instructions for either leimtype or stannotype have yet been published, but I have before me a printed pamphlet, without date, which Mr. Woodbury issued as instructions for his later stannotype process—that in which the relief itself was printed from—a pamphlet which Mr. Woodbury himself gave me, I think, in 1885. This pamphlet and some other particulars which I have in hand, partly received from Mr. Woodbury and partly the result of my own experience, enable me to give such directions for making washed out reliefs as should enable any attentive student to get over all difficulties connected with the making of deep reliefs by the washed out gelatine process, and adapting these reliefs to the production of direct printing blocks, or, indeed, using them as a basis for electrotypic moulding. I propose to say nothing about such matters as the production of any necessary grain, nor do I intend to occupy space in mentioning whether a negative or positive, reversed or direct, is to be used in any particular case, as these matters are obvious enough to anyone who thinks. The gelatine tissue, which is virtually a carbon tissue with a thick but slightly pigmented film, is prepared as follows: A sheet of stout plate glass is slightly waxed by being warmed and rubbed over with genuine beeswax, the excess being polished off with a piece of flannel. A piece of close textured and rather thick paper, about half an inch shorter each way than the

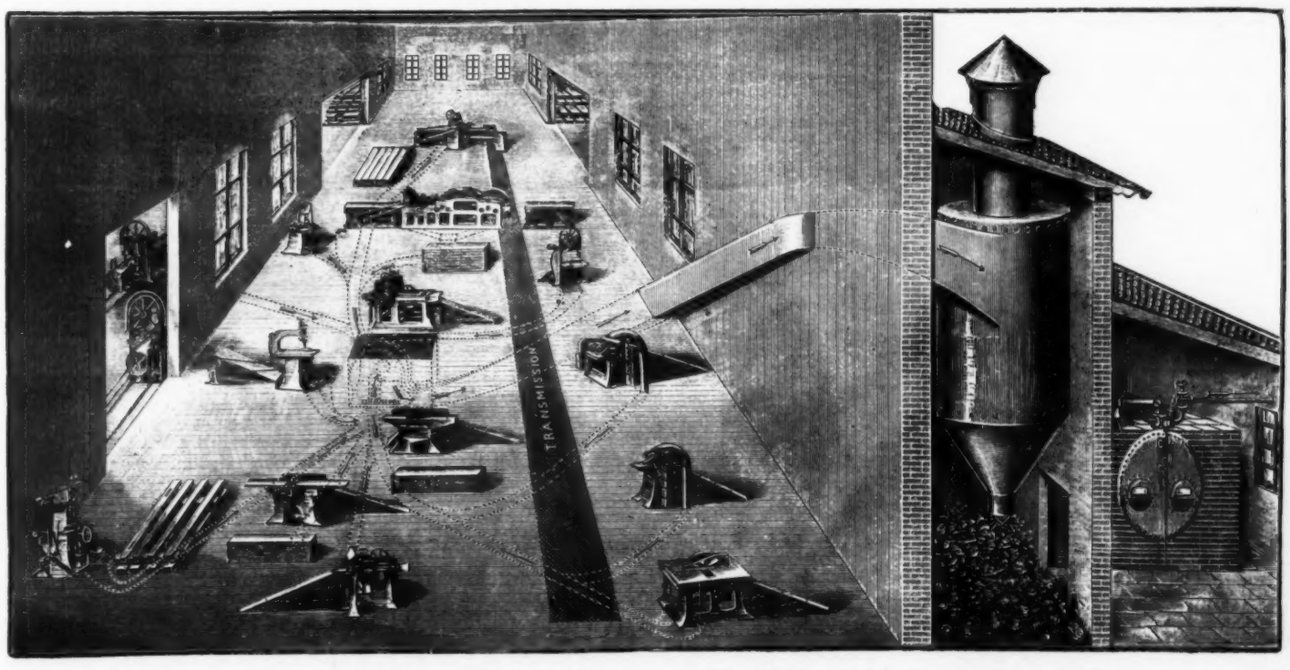


FIG. 2.—VIEW OF A WOODWORKING SHOP PROVIDED WITH AN ASPIRATOR AND SEPARATOR.

glass plate, is now immersed for a few seconds in warm water, together with the plate, and they are taken out of the water together, so that no air is inclosed between the glass and the paper, after which contact is established by means of a squeegee, and the plate is set paper upward on a leveling stand.

As the following gelatinous mixture must be poured on the paper-covered glass while the paper is still damp, it is obvious that the mixture must be prepared before the paper is squeegeed to the glass. The mixture consists of—

Water	20 ounces.
Nelson's transparent sheet, or amber gelatine	5 "
White sugar	1 "
Indian ink	5 gr. (or less.)

The gelatine is soaked in nineteen ounces of the water, and when softened, the sugar is added, and the heat of a water bath is applied until the solution of the gelatine is complete, when the Indian ink, which should previously have been rubbed up with the remaining ounce of water and filtered through fine muslin, is stirred in. This mixture must be heated and stirred until no trace of ropiness remains; and, indeed, churning with a whisk churn is an advantage. Time must be allowed for all bubbles to rise to the surface, and then they must be skimmed off. The paper-covered plate is now flooded with the liquid, and at this stage it is generally convenient to go over the surface with an edge of paper used as a skimmer, and afterward to carefully add a little more of the mixture to make the whole up to as much as the plate will hold, which will generally be a layer about one-sixteenth of an inch deep.

As soon as the gelatine has set, the plate (or plates, as a large number can be coated from one batch of the gelatinous mixture) can be ranged in racks to dry, and when dry the tissue can be readily removed from the glass by cutting downward just inside the margin of the paper, and then lifting one corner with the point of a knife. For sensitizing, however, it is sometimes convenient to allow the tissue to remain on its glass plate, at other times it is preferable to remove it. In the former case, the face of the tissue is freely mopped over with a solution of half an ounce of ammonium bichromate in eight ounces of water, half a drachm of liquid ammonia being then added. If this free mopping, with almost flushing of the surface, be continued for five minutes, it will be sufficient. The separated tissue is best sensitized by immersion in the above bath with constant movement, and three minutes will generally be sufficient, after which the tissue is tacked by its edges to a light wooden frame, small tinned tacks being convenient.

This extra thick tissue cannot be advantageously dried in an ordinary warmish room like the usual carbon tissue, as it would be too prone to becoma insoluble under these circumstances. It is best dried by being supported face downward a little distance over the surface of some perfectly dry chloride of calcium contained in a flat dish, the whole being inclosed in a tin or wooden box having a well fitting lid. Provided that the chloride of calcium is well dried in an oven immediately before use, and the room in which the drying box is placed is not below 60° F., tissue placed in the drying box overnight will be ready for use in the morning. In the case of the tissue on the glass the margins must be cut through just inside the edge of the paper, as before mentioned; and in the case of tissue dried on the frame, the tissue must be cut out of the frame without any attempt to utilize the extreme margins. In printing under a negative or positive, a safe edge or opaque mask completely protecting the edges of the tissue from light is essential, and it is desirable that the opacity of this safe edge should be graduated from the inside to the outer edge. Exposure must be long, at least three or four times as much as would be required for an ordinary carbon print under similar circumstances, and obviously in a general article like this no minute directions can be given; but trial slips, under an original of similar character to that used, will best serve in ordinary cases.

The glass plate upon which the tissue is to be developed is coated with collodion—whether plain or iodized is a matter of indifference, as the iodizing salts wash out; and when the collodion is set the plate is soaked in water till all signs of repulsion disappear, and the water flows evenly from the film on removal from the dish.

The tissue being now soaked in water till flaccid, is squeegeed down on the collodionized surface. A pad of blotting paper is now laid over the tissue, then a sheet of stout glass and on this a weight, say at the rate of a pound for every four square inches of surface. All should now remain at rest for fifteen to twenty minutes in order that good adhesion may be established. The plate is next put into a dish of water heated to and maintained at about 120° F., and soon the gelatine will begin to exude from under the edges of the paper, and in about twenty minutes the paper backing can be stripped off, leaving the mass of the gelatine on the collodionized glass plate. Long soaking in water kept at from 110° to 120° F. is required to dissolve away all superfluous gelatine, from four to six hours being about the usual time, and occasionally the water must be made to flow briskly across the plate. A final rinse with rather hotter water is now given and this is followed by cold water and a setting up of the plate to drain. The plate is now soaked for several hours in methylated spirit, and when taken out the relief will dry in a short time. If it was originally intended to strip the dry relief from the glass, the glass should have been waxed before collodionizing. In this case all that is needed is to cut the film through to the glass all round the edges, and the film will readily separate on lifting one corner with a knife.

In the case of Woodbury's later form of stannotype, the printing surface was a relief made as above described, adhering to the glass plate, and obtained by printing the tissue under a transparent positive. To protect the relief from the action of the aqueous ink, it was coated with tinfoil and used precisely as the ordinary lead printing block in the usual Woodburytype process. A solution of India rubber made so thin as to flow readily is poured over the relief, and a thicker solution of India rubber is brushed round the edges of the plate. When all is dry a sheet of tinfoil is laid on, and contact is established by a press composed of a pair of India rubber rollers, so arranged that they can be separated to such a distance as to allow the glass to pass easily between them. When the middle of the glass plate is between the rollers, pressure is applied by bringing the rollers nearer together. The handle of the roller press is now worked backward and forward, the range of motion being extended at each action until both extremes of the plate have been reached. A damaged tinfoil facing can be removed by scrubbing with a few drops of mercury, and all traces of India rubber can be cleared off with benzole, leaving the relief ready to be recovered.

An interesting method of direct printing from the gelatine film is the photo-filigrane of Mr. Woodbury, in which the relief is passed between polished rollers, together with a sheet of paper, whereby a simulation of water marking is produced.

In connection with Mr. Woodbury's method of making a washed out relief on a rigid surface for his stannotype process, we have a method by which such a relief or other rigid surface may be reproduced electrotypically without any loss of levelness; this method having been employed in one of the earlier stannotype processes. As this method may have special importance in connection with future developments of process work, I give it in brief.

A relief on glass, prepared as described, is slightly smeared over with soft fat, and a sheet of thin tinfoil, quite free from holes and brushed quite flat with a soft hat brush, is laid on it, and rolled in contact, as already described, the tinfoil being a trifle smaller than the glass plate. Fresh rollings are now given, with a few layers of blotting paper over the tinfoil, until every detail is perfectly moulded. The edges are now varnished, first with shellac varnish and afterward with India rubber varnish, and, after the back of the tinfoil has been cleaned with a tuft of cotton wool, moistened with caustic potash and then rinsed with water, a layer of copper is deposited on the tinfoil, giving an electrotype thinly faced with tin, which electrotype Woodbury backed up and removed in the following way: The plate bearing the electrotype and another glass plate of similar size were both placed on a hot plate, heated to the temperature of boiling water, and rubbed over uniformly with a stick of the following composition:

Shellac	3 parts.
Common resin	2 "
Venice turpentine	1 "

The coated surfaces were laid together and a weight (also warmed) placed on the top, when the excess of the resinous composition becomes forced out as the heat from the hot plate, upon which the plates must rest, thoroughly penetrates. All being now allowed to cool, separation was easy, and the planimetry of the mounted electrotype is such that it can be used as a Woodburytype mould.—The Process Photogram and Illustrator.

A NEW TEST FOR OLD PAINTINGS.

THE practical value of Roentgen's famous discovery lies in its revelations of the unseen. While the applications of this instrument of research have hitherto been confined almost entirely to surgical diagnosis, yet there are other important uses to which it can be put. The genuineness of jewels has frequently been ascertained by means of the X rays. The contents of suspicious-looking parcels in the mails have been similarly investigated by French postal officials. It is rumored that Pittsburg experts have thus been enabled to detect flaws which could not otherwise be perceived in armor plate. And now, says the New York Tribune, comes an interesting story from Germany about the identification of a painting by Albrecht Dürer.

Herr Friedrich Burger, of Munich, owns a head of Christ that has been accredited to the famous Nuremberger. Dr. Oscar, Baron Lochness von Huttenbach and Dr. Nagler, in their critical writings, have referred to this picture in terms of high praise. Nevertheless its authenticity has been questioned and, in order to remove all doubt (if possible), its possessor recently decided to submit it to examination by X rays. The painting was on wood, and was believed to have been executed in 1521. It was, presumably, 376 years old. Naturally it was much discolored and very dingy with age. Besides, like many another old picture, it had probably been retouched by the brush of the "restorer." What might lie below these obscuring veils, who could tell? A firm of dealers in electrical apparatus, Friedrich Haller & Sons, undertook to make the experiment. Their earlier attempts were fruitless. Finally, however, they obtained a photograph by means of the X rays, which had penetrated both the pigments and the wooden panel on which they had been laid.

The photograph thus obtained revealed much that the eye could not perceive. The features of the thorn-crowned Jesus, the drapery about the shoulders and the hands which grasped the latter appeared much more distinctly than in the painting. But there also came to light a Latin inscription in quaint Gothic characters, the monogram of some grand duke (for whom, perhaps, the picture was painted), the artist's initials and the date "1524." This last is not the one which had been looked for, but it will, of course, be accepted as the correct one.

It is said that the photograph reveals the grain of the wood (evergreen oak) and the fiber of a silk handkerchief stretched thereon. These, together with the paints and varnish, make it necessary for the X rays to penetrate to a depth of two centimeters, or about four-fifths of an inch. Artists, collectors and scientists are all greatly impressed by the results of this interesting test. Copies of the photograph have been sent to a number of distinguished people in Europe. The Queen Regent of Spain having been thus complimented, she sent her specimen to one of the academies of art in Spain, and it was the subject of favorable comment there.

The Swiss railways are adopting electric light in their trains to a great extent. According to the Schweizer Bauzeitung, 535 passenger carriages in Switzerland are now lit electrically, and the number is continually increasing. Some of the lines intend to light all their trains by this means at an early date, and many more are adopting it on all their new carriages.

SELECTED FORMULÆ.

Perfumed Toilet Ammonia.—The following is original and highly commended:

Distilled water	5	pts.
Liq. ammonia forte	2½	pts.
French rose water	5	ozs.
Soluble ess. of orange	7	drs.
Soluble ess. of lemon	7	drs.
Soluble ess. of neroli	6	drs.
Soluble ess. of bergamot	2	drs.
Soluble ess. of rosemary	2	drs.

Mix the essences with the distilled and rose water, and then add the ammonia.—Practical Druggist.

A Sensitive Test for Nitrous Acid.—Prof. Riegler recommends (Zeitschr. anal. Chem.) the following test, which will answer for general purposes as well as testing for the presence of nitrous acid in drinking water and urine: Into a test tube 2 to 3 cg. of crystallized naphthionic acid are introduced, then 5 to 6 c.c. of the fluid to be tested; these are well shaken and 2 to 3 drops of concentrated hydrochloric acid added and again shaken; the tube is then held at an angle and 20 to 30 drops of aqua ammonia are allowed to flow down the side so as to form a layer above the other fluid, and at the line of contact a rose colored ring forms when but the slightest trace of nitrous acid is present. Since dilute solutions of naphthionic acid have a violet fluorescence, it is advisable to observe the color by transmitted light.

Acid Resist for Photo Engraving.—Gum turmeric has been suggested by a writer in Photographische Chronik as a substitute for asphaltum as an acid resist. The formula is thus given:

Chinese turmeric	10	parts.
Alcohol	100	"
Oil of lavender	5	"
Methyl violet, saturated solution in alcohol	2	"

The above solution is used as bitumen or asphalt is, only that the development is with alcohol. It can be used on paper and treated as in photo-lithography, without inking. The developed turmeric transfers to stone like transfer ink, and is etched in the same manner.—Practical Process Worker.

Blue Ink.—We all know the good old blue ink which was made by dissolving Prussian blue and oxalic acid in water. Its place seems to have been nowadays largely taken by solutions of blue aniline dyes in water. Perhaps in this respect the old was better, and we ought to be indebted for our blue ink to the purifiers and their cyanogen products rather than to the tar and its aniline products. In our contemporary, Le Goudron, M. Ch. Ed. Guignet gives an account of his methods of making soluble Prussian blue. One of these is to stir an excess of pure Prussian blue in a paste, with a saturated solution of oxalic acid, and to leave the filtered solution to itself for two months. The Prussian blue all falls to the bottom, but if it be washed with weak spirit to remove the oxalic acid, it is found when dried to be very soluble in water.—Progressive Age.

"Tasteless" Castor Oil.—Probably the most agreeable way to administer the oil is in an emulsion, and a formula for producing one is as follows:

Castor oil	1 ounce.
Yolk of egg	1 "
Sirup	2 drachms.
Tincture of orange peel	1 "
Water to make 3 ounces. Mix and make emulsion.	

Another:

Castor oil	1½	ounces.
Powdered gum arabic	2	drachms.
Sugar	2	"
Peppermint water	4	ounces.

Mix and make emulsion.

It has also been stated that hot milk affords a vehicle which does away with the unpleasant taste of the oil to a certain degree.—Druggists' Circular.

A Good Concrete.—A concrete is used in France for building purposes that possesses the necessary qualities of solidity and hardness. It is composed of 8 parts of sand, gravel and pebbles; 1 part of common earth, burned and powdered; 1 part of powdered cinders and 1½ parts of unslaked hydraulic lime. These materials must be thoroughly beaten up together; their mixture, when properly moistened, gives a concrete which sets almost immediately, and becomes in a few days extremely hard and solid, properties which may be still further increased by the addition of a small quantity—say 1 part—of Portland cement. It is stated that many large buildings have been constructed of this material in France—in one case a house three stories in height, 65 × 45 feet, standing on a terrace, having a retaining wall built perpendicular 20 feet high and 200 feet in length. Every part of this structure was made of hard concrete, including foundations, vaults of cellars, retaining wall, and all walls exterior and interior, as well as the cornice work, mouldings, string courses, parapets and balustrades, and the building has no band iron in the quoins or other plan to bind it together. All lintels over doors and windows and sills are composed of the same materials, being cast in moulds.—National Builder.

Paint for Metal Surfaces.—The evidence is accumulating in favor of graphite paint as the paint of the future for the protection of all exposed iron and metal work. Prof. Spennrath, director of the technical school of Aix-la-Chapelle, lately won the $2,000 prize offered by the Society for the Advancement of the Industrial Arts for the best essay on protective paints. The prize was not won simply by theoretical demonstrations, although the professor furnished scientific reasons also, but by most carefully conducted practical experiments with various pigments and oils, covering several years' time. The results demonstrated that a properly made paint of graphite and boiled linseed oil is the most suitable for protecting structural iron-work, roofs, etc., exposed to the destructive agencies of heat, cold, storms, etc.

ENGINEERING NOTES.

The syndicate has been formed to tunnel the Great St. Bernard, connecting Turin and Lausanne by rail.

Russia is trying to increase the speed of her railroads. The journey from St. Petersburg to Moscow was recently made at the rate of 46 miles an hour.

Since the Crimean war, the charges of powder have, according to Sir Benjamin Baker, been increased from 16 to 19 pounds. The weights of the projectiles from 68 to 1,800 pounds, and the energy developed from 1,100 to 62,000 foot tons.

A twin screw steamer for Lake Baikal in Siberia was recently built at Glasgow. It is 115 feet long and draws only three feet of water. It will go through the Kara Sea to the Yenisei River, up that river to the Angara and through rapids into the lake.

According to the British Parliamentary returns, the quantity of coal used for gas making in Great Britain aggregated 4,928,695 tons in 1882, from this 49,360,289,059 cubic feet of gas were made, but in 1895 the amount of coal consumed had reached 11,937,446 tons; from this were produced 121,421,752,691 cubic feet.

Five of the North River piers in New York City have been rented respectively to the White Star, Cunard and Wilson steamship lines. The White Star Company is to pay $84,375 each year for piers 1 and 2 for ten years, and for the second and third term of years the amount is to be increased. Each pier is 125 feet wide and 697 feet long. The other companies rent somewhat similar piers at varying rentals.

It is stated by the San Francisco Call that the Southern Pacific Railway Company and the North German Lloyd have entered into an agreement whereby the latter will establish a line to ply between Bremen and Galveston. The steamers will act as feeders to the Sunset route. It is expected that the Hamburg-American line will also compete for business at the port of Galveston. The same rates will be charged from European ports to Galveston as to New York.

It is said, to stop a steamer like the Etruria, for instance, whose displacement is 9,680 tons and whose horse power is 14,321, two minutes and forty-seven seconds are required, and during this process of stoppage the ship will forge ahead 2,464 feet or nearly one-half a mile. The United States cruiser Columbia, with a displacement of 7,350 tons and 17,991 horse power, would require two minutes and fifteen seconds to stop, and the distance which it would run before stopping would be 2,147 feet in each case; the vessel is supposed to be going at its highest rate of speed and the stoppage is produced by reversing the action of the propeller.

The work of enlarging the Victoria Bridge at Montreal will be begun within the next month and completed within the next year. More than $1,500,000 will be spent on the work and employment will be given to hundreds of men. The contract for the construction of the bridge has been let jointly to the Dominion Bridge Company, of Montreal, and the Detroit Iron and Bridge Company, Detroit, Mich. The bridge when completed will be an open truss steel structure with double steel tracks and facilities for foot passengers, vehicles and electric railways. The work of reconstruction will be done without interfering in any way with the operation of the trains over the bridge.

The longest span cableway in the world is that put in something over a year ago for the construction of the Holyoke dam, Holyoke, Mass., says the Railway Age. It has a length of 1,650 feet. The longest span cableway previously erected was one of 1,505 feet at Point Pleasant, W. Va. The Holyoke cableway has recently been remodeled by the Lidgerwood Manufacturing Company, putting in a new Lidgerwood carriage and the Miller patent fall rope carriers. The original contractors for the cableway used a Lidgerwood engine, hence the plant as it stands to-day is practically the same as the ordinary Lidgerwood cableway. The head tower is 125 feet high; the load carried, six tons. The contractors for the dam, Messrs. Fruin & Bambrick Construction Company and H. S. Hopkins, have expressed themselves as entirely satisfied with the cableway as remodeled.

Pile Driving through Stone.—In a paper recently read before the American Society of Civil Engineers, Prof. W. H. Burr described some experimental pile driving through new stone filled crib work. Nineteen piles were driven. The crib was 35 ft. deep, and the piles, from 52 ft. to 60 ft. long, were shod with chilled cast iron points, held by straps spiked to the pile. The hammer used in the driving weighed 3,500 lb., and the greatest number of blows was 350. There was no difficulty whatever in driving the piles, and there were no failures. In the discussion following the reading of the paper several other gentlemen gave particulars of pile driving through loose rock. The shoe used in the work of the New York department is conical, the angle of the cone being about 60 deg. The base of the cone is flat, and it is secured to the cone by a pin cast as part of the shoe and let into the end of the pile. This type of shoe is said to have proved very satisfactory in practice.

The system of wood working known as the "built-up" method, and now coming more and more into vogue, is said to be employed advantageously in the manufacture of doors, the claim being that, by thus cementing together thin boards or veneers of different woods transversely with the grain, greater strength, flexibility and durability are obtained than exist in an equal sized piece of any of the woods individually. Doors made in this manner cannot twist or warp under any conditions, are much stronger than ordinary mortise and tenon or doweled doors made of one kind of wood; and a firm in Buffalo is now making successfully doors of built-up woods, leaving the frames hollow, which is a saving of material and produces a lighter and stronger door. In Canada built-up boards are employed for packing cases, trunks, etc., for which purpose the workman cuts sheets of veneer from the log, which is made to rotate against a knife, and the veneers are then glued up with the grain crossed, the result being a strong board, of considerably greater strength than much thicker wood of any other kind.

ELECTRICAL NOTES.

The English incandescent lighting tendency is entirely toward higher voltage (200 to 250) lamps. Such lamps have been used in mining plants in the United States for two years with satisfactory results, except that the ordinary key socket is not well adapted to 220 volts.

The Allgemeine Elektrizitäts Gesellschaft, of Berlin, Germany, is erecting an electric light and power station of 1,000 horse power at Friedenau, a suburb of Berlin. The capital of the company has just been increased from twenty-five million marks to thirty-five millions. —Elektrotechnische Rundschau.

The Watt Accumulator Works are introducing their storage batteries for surface cars in Berlin, Germany. It is stated that it is sufficient to charge the batteries during six hours of the night, and they may then furnish a full day's work of about 100 miles at 10 miles an hour. The new cars are remarkably light, weighing only 84,000 kilogrammes with their full complement of passengers.—Elektrotechnische Rundschau.

"The longest unsupported telegraph wire," says Cosmos, "is in Switzerland. It crosses in one span the Lake of Wallenstadt in the canton of St. Gall, and was put up by the Swiss telephone bureau. Its extremities are fastened to two iron towers 2,400 meters [7,872 feet] apart. In the lowest part this conductor is 40 meters [131 feet] above the water level of the lake. The line is of excellent steel and only two millimeters [1/12 inch] in diameter."

The fire superintendent of Chicago has reported on 106 cases of fire attributed to electricity. He says that 95 only were really due to this cause; and some of the cases are curious. Contacts of trolley wires with telephone wires caused three; high tension wires with nails or screws driven into them caused three; imperfect insulation of open-air high-tension cables caused twenty-four; two cases arose through decorations having been set on fire by the heat of electric incandescent lamps; and a rat eating through the insulation was responsible for one case.

It is reported, says L'Elettricita, that the Upper Italy Electricity Company and the Mediterranean Railway Company have concluded an agreement for the application of electric traction to the railway trains in the Mont Cenis Tunnel between Bardonnecchia and Modane, and, further, it is intended subsequently to extend the system of electrical traction down to Turin. L'Elettricita thinks, says the English Electrical Engineer, if this latter extension proves a success, it will be only a forerunner of the complete conversion of the railways to the electric system; at any rate in all those districts in which it is possible to make use of the numerous waterfalls with which Italy abounds.

The power transmission plant now being built under the supervision of the Royal Electric Company, Montreal, Can., at the Chambly Rapids of the Richelieu River, about 16 miles east of Montreal, will involve several novel features, says the Engineering and Mining Journal. The point of chief interest is the generation of transmitting energy at a line potential of 12,000 volts, without the use of step-up transformers. Each unit in this plant will consist of a 2,500 horse power Stanley-Kelly-Chesney two-phase inductor generator, and two 48 inch twin Victor turbines, all mounted on one horizontal shaft. Each generator will have an enormous flywheel regulation, resulting from the great mass of the iron conductor, 14 feet in diameter, and the generator will have no compound winding to increase the surging effects of the idle currents, but will have an inherent regulation of 4 per cent. in all.

The directors of the Hanover tramways have recently published a report, says Engineering, in which they narrate their experiences with accumulators as the source of power for cars. In Hanover both overhead wires and accumulators have been used for a considerable time, so that the managers are in a position to institute a reliable comparison. Taking everything into account, they pronounce in favor of the storage cell. The cost of maintenance has been determined with the utmost exactitude for the year 1896, and the average comes out at 40 marks per wagon per month, equivalent to 75 groschen per kilometer. The estimate includes the cost of renewing the plates. Having regard to the expense involved in the maintenance of the overhead line and its accessories, as well as to other circumstances, the managers arrived at the conclusion that the additional cost of accumulators does not exceed one groschen, or one-tenth of a penny, per mile. Consequently it has been decided that the entire system shall, as soon as the requisite arrangements can be made, be driven by secondary batteries.

The cause of the fire which destroyed the power house of the Union Traction Company in Philadelphia, on March 3, has been reported by Mr. William McDevitt in the quarterly fire report of the National Board of Fire Underwriters as follows, says the Engineering News:

"A hoisting crane, belonging to an overhead crane, which was held back by resting on a guard rail, was drawn from its position by a moving of the crane by employes at the other end of the room. This caused the chain to swing down against the flywheel of the engine, from which it rebounded and struck against one of the lead heads to which the conductors were attached on the generator, causing a violent flash. Another employe grasped the dangling chain with his hand but finding it too hot took his hat, and, securing the chain, prevented it from doing further damage. The swinging contact (the chain being grounded) produced a short circuit for an instant, but the machine resumed its normal speed intact until the engine was stopped. In the mean time molten metal had been spattered down into the flywheel pit, setting fire to a board partition at that point, and at the same time igniting the insulation on the conductors. Every effort was used to extinguish the fire, but, owing to the dense smoke, the attempt was unsuccessful. Upon the arrival of the firemen the same obstacle was met, preventing access to the cellar, where the fire at that time was confined."

The primary cause of this fire, from a grounded hoisting chain causing a foreign contact, may be classed as an accident, but the occurrence of a similar accident (without causing fire) at another establishment of like character, should serve as a lesson to be observed in the future management of all such risks.

MISCELLANEOUS NOTES.

The British consul at Chicago reports that, in the West, German goods are driving out English manufactures, particularly in the importation of cement, chemicals, quinine, pottery, glass and mirrors, cutlery, colors, oils, pictures and toys.—Uhland's Wochenschrift.

A. Brandt, in his writings on the human beard, proffers an opinion directly opposing that of Darwin, that the beard is a hereditary remnant of animal growth. According to Brandt, it is an acquisition, so that even the occasional beard of women has a prophetic significance. For as man has overtaken woman in his whole organization, so it is the case also with reference to the beard. But slowly women are following, and now 10 per cent. of them show a stronger growth. The woman of the distant future would then likewise be adorned with a beard.—Die Umschau.

When a beverage charged with carbonic acid gas is subjected to the action of heat, the increase of pressure due to the rise of temperature will depend on various conditions, says the American Carbonator. Water at a temperature of 50 deg. Fah. absorbs its own volume of carbonic acid gas; in other words, if we suppose a bottle charged with carbonic acid gas only at a pressure of 70 lb., it will add nothing to the pressure to fill the bottle with water at 50 deg. Fah., as the water will absorb the entire amount of gas. The reason this condition is not attained in practice is because of the presence of more or less air in the bottle, air being considerably less soluble in water than in carbonic acid gas.

A form of speaking tube for use of steamers has recently been introduced in England. The peculiarity of it lies in the fact that the pipe is insulated from the body of the ship by a covering of waterproof textile material. This latter, being a very bad conductor of sound, enables long lengths of tube to be used without rendering the speech transmitted inaudible at the far end. The distance from the bridge to the engine room on the steamer India is over 300 ft., yet even with the engines running it is possible to hear clearly in the engine room, through the tube there fitted, orders given on the bridge. An electric call is fitted, as the ordinary whistle cannot be used for so long a length of pipe.

Phosphorus matches, says a writer in the Boston Transcript, were first introduced on a commercial scale in 1833, and the first United States patent for friction matches was issued in 1836. The present "safety" match was invented by a Swede named Lundstrom, in 1855. The so-called "parlor" match was invented in 1848 and originated with the manufacture of Schrotter's amorphous phosphorus, which is odorless and tasteless, is not poisonous and does not take fire at ordinary temperature. The first practical friction match was invented in 1827, by Mr. Walker, an English apothecary. He coated slips of cardboard with sulphur and tipped them with a combination of antimony, chlorate of potash and gum. These matches were sold in a box of 84 for one cent and a piece of glass paper was provided to rub them upon.

The American coal trade had a prosperous year for 1896, says Industries and Iron. The prosperity still continues, whether it be due to the controlling policy of the combined anthracite operators or to good business conditions, or to each of these two causes in part. Steam coal is now worth from 25 cents to 50 cents per ton more than in the autumn of 1896, and the present rates are not far from the highest average quotations for the whole of that year. Compared with the figures for 1895, the average price is 40 cents per ton higher. The foreign trade is insignificant in relation to the volume of the total output, the exports last year, for example, amounting to only 2 per cent. In regard to the imports, the greater quantity is drawn from Canada and British Columbia. There are occasional cargoes from Japan and Tonquin, as well as rather more frequent ones from Australia.

A novel kind of flooring has been provided in the power station of the Edison Electric Illuminating Company, of Paterson, N. J. This floor consists of a huge casting of cement forming the undivided floor of the entire station. The floor proper is 4 in. in thickness, but at intervals of 15 ft. there is cast on the back or under side of this 4 in. web a beam 18 in. in depth and 9 in. in width, running crosswise of the station and resting upon the supporting piers of brick. The floor is further stiffened by longitudinal ribs 14 in. in depth, and tapering from 4 in. to 6 in. in width, placed 3 ft. 6 in. apart, running between the heavier crosswise beams lengthwise of the station. These stiffening projections are a part of the main casting, so that the floor is virtually one immense casting of cement, with stiffening ribs on its under side, supported upon brick piers. The floor is completely fireproof, and is said to cost less by one-third than a floor involving the use of iron beams, while it affords a firm foothold, and presents a surface sufficiently smooth to be easily kept clean. It will be interesting to learn what effect oil will have upon it.

A test of nine chemical fire extinguishers of different makes was made at the car shops of the Pennsylvania Company on April 20, with a view to determining which kind should be used on railway trains, in order to comply with the Ohio State law, says the Engineering News. The law provides that one coach on each train shall be provided with an extinguisher the first year and one additional coach each succeeding year until all are supplied. The tests were made under the supervision of the State railway commissioner, on whom devolves the duty of selecting the kind of extinguisher to be used. The tests were witnessed by the representatives of a large number of railways. The extinguishers were of 2, 3 or 4 gallon capacity, and were of the following makes: Gem, Firemen's Excelsior, Rex, Underwriter, Stemple, Muskegon, Guardian, Hensley and Babcock. In making the tests fires of the same kinds of combustible were burned from 17 to 30 seconds, when the extinguisher was applied. The Stemple extinguisher was exhausted in 40 seconds and the fire had to be put out by the fire department. The Muskegon was exhausted in 1 minute, when the fire was almost out. The other extinguishers succeeded in putting out the fire in times ranging from 1 minute to 1 minute 35 seconds.

A BEAR FAMILY.

THAT there is nothing at all ferocious in the aspect of the bears and their young shown in the accompanying picture will be the first thought, and the idea that the good nature and playfulness exhibited is that of wild beasts seems hardly possible. The attachment of bears to each other after pairing has often been noted, while the wonderful affection of the female for her cubs has formed the subject of many a touching story, and these qualities seem to be well portrayed in the actions and looks of the specimens shown in the engraving. For our illustration we are indebted to Der Zoologische Garten, published by J. J. Weber, Leipzig, Germany. It may be mentioned that the European brown bear and the American black bear and cinnamon bear are closely allied and very similar in their habits. They will, all of them, rarely attack human buings, though they may become savage if attacked or wounded, especially after they have grown old. They are excellent climbers, fond of honey, great devourers of roots, green wheat, berries, nuts, etc., and occasionally take a calf, pig or sheep. The brown bear is distinguished by the prominence of his brow above the eyes, which is abruptly convex, with a depression below them, and the black bear by the regular convexity of its whole facial outline, from the ears to the muzzle.

AN INTERESTING BEAR FAMILY.

REPTILES OF THE DESERT.

FROM the standpoint of a zoölogist there is probably no class of animals so characteristic of the desert as the reptiles. True, there are numbers of birds and mammals found all over the arid wastes of sand, but these either migrate or spend most of their time underground, as is the case with most of the smaller mammals. The birds choose the sheltered canyons, where, perhaps, a few drops of water will ooze out from between the rocks, or even venture out into the great sunbaked plains, seeking the shelter of the bushes and stunted trees which here and there manage to eke out an existence. The smaller mammals are almost all nocturnal in their habits and only venture out after nightfall, when the earth begins to cool a little, and, with the exception of, perhaps, a few coyotes or the little desert fox, one may travel for hundreds of miles through the deserts without seeing a single animal except the reptiles and insects. The burning sands and the copper skies seem to have no terrors for them. At nearly every step one seems to awaken a fresh lizard from his rest under a bush or beside a stone, and away he goes, scurrying along over the sand, perhaps his long tail dragging in the sand, but more frequently elevated high in the air. In fact, this uplifted tail often looks like a little gray twig moving rapidly along the ground, but always retaining its upright position. And these lizards can run, too. In a twinkling they are gone, and then it is only the practiced eye that can see them, for when they lie at rest their dull gray color makes it almost impossible to see them.

But these are not all. Often from the side of the road, disturbed by the passing traveler, a horned rattlesnake or sidewinder will move sluggishly away, but ever keeping up an incessant rattle. Again, big sluggish lizards are found, nearly always a dull gray above, but beneath or around the head iridescent in the most gorgeous colors. And, too, the big tiger rattler of the desert canyons, though a trifle more sluggish than the sidewinder, seems ever ready to call attention to his bright colors by sounding the terrible rattle which strikes fear to the heart of any animal, no matter how large or how small. The tiger rattler is found in the desert regions of America, and is comparatively rare, being found only in the canyons of the barren ranges which traverse the desert in all directions. Though very dangerous, and sometimes growing to four feet in length, it cannot compare in

viciousness with the little sidewinder or horned rattlesnake. The sidewinder prefers the open desert in which to live, and may often be found lying quietly beside some desert bush waiting for its prey. It gets the name sidewinder from the fact that, in moving along the ground, instead of pursuing a straight course, it has, besides the forward movement, a sidewise, crablike motion. It is much less sluggish than the other rattlers, perhaps on account of its small size, as it seldom exceeds a foot and a half in length. It is lighter colored than the other rattlers, and directly over the eyes are protuberances which give it the name horned rattler. It seems to be the most dreaded of all snakes by the desert traveler, probably on account of its being so hard to see, owing to its small size and quick movements. In fact, it is about the only reptile which the desert prospector really dreads.

One of the most plentiful of the lizards which live on the desert is the blue spotted lizard. It is about eight inches long and of a light ashen color on the back, but down each side runs a row of black spots, extending out on the tail. It receives its name from the two sulphur-blue patches, one on each side of the abdomen, and the little blue spot on the chin. One variety is blue nearly all over, giving out beautiful iridescent metallic colors. Probably the most characteristic of the lizards of the lower desert regions of California is the long tailed or gridiron tailed lizard. This species is found nearly everywhere in the lower parts of the desert, and never fails to attract the attention of the traveler by its exceedingly rapid movements and its very strange habit of carrying its tail curved up over its back. In fact, the tail is the largest part of the animal, being longer than the head and body together. The movements of this little gray lizard are so quick as to make it hard for the eye to follow, and when it shoots off along the sand, with its tail high in the air, it looks almost as if a stick, standing on end, were scurrying away.

There is living in the mountainous parts of the Mojave Desert a very strange lizard, which often reaches a length of over a foot, and which is nearly as wide as one's hand, and of a uniform dark slate color, or even black, while the tail is spotted with white, and often nearly uniformly white. At a distance this species looks like a Gila monster, and many people, unacquainted with the latter, have supposed them to be the same, and I think it is due to this mistake that many people believe the Gila monster an inhabitant of California.

There is a very pretty and withal a very strange lizard found in several localities in the Mojave Desert, which has been named by scientists Dipsosaurus dorsalis, on account of its near resemblance to the ancient saurians which inhabited the earth many hundreds of years ago. Until the last few years it was not known that this strange lizard lived further north than Lower California, but recent explorations have proved that it inhabits the desert region as far north as the Panamint Mountains, in Inyo County. It has a thick, finely scaled neck and heavy legs which support a rather clumsy body, and a long, tapering tail. The body is beautifully mottled, while the entire length of the tail is covered with transverse bars. The under surface of the body is whitish, while blotches and lines of red on the shoulders and sides, with the white spots on the sides, make it a very pretty lizard. The tail is longer than the head and body together, the total length over all measuring nearly fifteen inches in an adult male.

There are at least three species of horned toads living in California, one on each side of the Sierra, but the one that is found on the west, and which is so well known to every boy in California, has been found so near the eastern borders of the Sierra foothills as to be almost included as one of the reptiles inhabiting the desert. The third species never gets into the Sierra. In general appearance the desert species is very similar to the one found in the inland valleys, but is of a lighter color, and the arrangement of the scales is somewhat different. The color may vary, however, from a dull white to a vivid brick red.—From the San Francisco Chronicle.

FINGER PRINTS IN THE DETERMINATION OF IDENTITY.

AN impression of the bulb at the internal extremity of the human finger exhibits a profusion of lines that are so fine and so close each other that it is scarcely possible to follow their course by the naked eye. But, after the impression has been greatly magnified, and it is seen reproduced in proportions say twelve times greater than reality (as has been done in the three principal figures that illustrate this article), the design as a whole is shown with perfect distinctness and with all its details.

One might be deceived and take such a production for a specimen of graphic ornamentation of barbarous origin. This remark is corroborated by the observations made not long ago by M. Abel Maitre, when he studied some linear incisions upon certain stones taken from the tumulus of Gavrinus, upon the coast of Brittany, and which are now deposited in the Museum of Saint-Germain-en-Laye. M. Maitre judged that these signs constituted an imitation of the impression of the finger such as the savage men of those remote epochs had seen printed upon the half coagulated blood of victims. Struck by this curious as well as unlooked for appearance, the men of that time probably tried to fix the form and make a rudimentary ornament thereof.

What gives a very peculiar interest to this figure, taken from life, is that the furrows of the skin possess a very pronounced symptomatic character. In fact, these furrows are probably the part that is least liable to change in the external constitution of men. They persist in their minutest details during life, from quite a tender age up to the epoch of senility. All these lines, with their innumerable ramifications, their intercrossings and interlinear figures, are so varied that it seems to us that no two fingers will ever be able to furnish an identical design.

We have here, then, an indelible individual brand that is of importance, and one asks himself why photographers, when a customer sits for his portrait, do not at the same time take an impression of one of his fingers. Could not a method be found of framing such a document so as to give it a fitting aspect?

Generally speaking, it is not difficult to learn how to take a distinct impression of a finger. The keepers in all the English prisons do it with sufficient success to verify the researches into the identity of habitual criminals. But, in order to preserve all the delicacy of the image that it is desired to make, it is evidently necessary to take particular care to obtain, in the first place, a faithful representation. A skillful photographer, whose professional occupation has already fitted him to perform every manipulation with much precision, will soon be able to take a good impression, and subsequently to practice this new branch of portraiture.

FIG. 1.—IMPRESSION OF THE END OF A FINGER, HIGHLY MAGNIFIED.

FIG. 2.—IMPRESSION OF THE END OF A FINGER, HIGHLY MAGNIFIED.

The two principal figures that we reproduce here (Figs. 1 and 2) are greatly enlarged impressions of fingers. The originals were taken by pressing the end of the finger upon a plate of polished copper covered with a thin layer of printer's ink applied with a roller. After this the finger, by a slight pressure, transferred the design to a sheet of white paper.

An enlarged negative of this was taken upon glass, and this negative, in turn, underwent a second enlargement in furnishing a positive upon paper. The accompanying figures have been accommodated to the size of this journal, but have undergone no other modification than this simple enlargement. The touch is rendered with perfect distinctness, and we can distinguish therein even the smallest projections of the sudoriffic glands.

Such impressions may be taken of all the fingers of individuals more than six and less than forty-five years of age. With younger children the experiment becomes difficult; on another hand, at an age more advanced than forty-five, the skin becomes rugose and somewhat dry, and the impressions are less distinct. In order to be sure of a good result, it is evidently necessary to take all sorts of precautions and pay attention to the least details. The ink and roller should be of good composition. It is necessary also to make a few trials in order to determine how fluid the ink should be. It is always possible to dilute the latter by adding to it a little drying oil before passing the roller over it, and the latter should be regularly cleaned before being brought into use.

As for the finger, that should be slightly moist, without, however, being wet. This is why, when the weather is hot, the finger should first be wiped. On the contrary, when the atmosphere is cold and dry, it will be well to dip the finger in tepid water before wiping it.

Sometimes, when the natural furrows are not very deep, as happens in some persons, the ink does not give an impression of the lines of the bulb sufficiently well. The layer of ink upon the plate should then be exceedingly thin, otherwise a displacement of the molecules would occur and the design would be blurred. The finger would remove but a part of the ink and deposit but a trace of it upon the

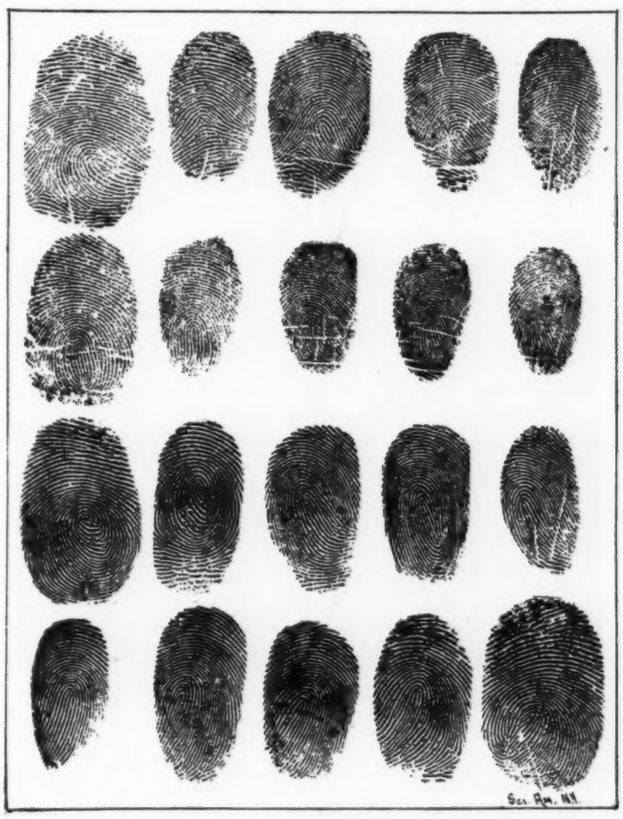


FIG. 3.—IMPRESSION OF ALL THE FINGERS (MAGNIFIED × ½).

Right hand, 1. Thumb and four fingers of a man forty-six years old.
" " 2. " " " " " woman twenty-six years old.
" " 3. " " " " " man twenty-eight years old.
Left " 4. " " " of the same.

paper. It will be seen that in this case the photograph and the enlargement would suffer thereby, since they reproduce and amplify the defects of the impression.

There is still another method to be tried, and the only other one up to the present that we are able to recommend. Instead of inking a metallic plate, a piece of polished glass may be smoked. The finger that presses upon this removes all the soot and leaves upon the glass a very sharp negative that may be used directly in a magic lantern, and from which also positives of the desired size may be printed.

Here again it is necessary to use some precautions. The smoke, for example, should form but a film upon the transparent surface and not become incrusted thereon, as sometimes happens under the action of the heat. We, however, have used printer's ink almost exclusively, and have always been satisfied therewith.

There is no distinction to be made between the fingers as regards the process in general. It may, nevertheless, be well to take an impression of the whole ten fingers of a person in order to select the one that possesses the most character, and then submit that to enlargement.

The specimens that we furnish in Figs. 1 and 2 were selected from among the elementary types which, according to a classification established by us, figure upon "ares" or curves. These are the simplest and the least complicated of all the impressions, and from the wealth of detail found therein we may draw a conclusion as to the variety that complete examples will offer.

In Fig. 1 we easily discern 19 distinct lines, and in Fig. 2 we find as many as 27.

Lines of such a character run over the entire inner surface of the hand, but upon the bulb of the finger they are shorter, and, moreover, for comparison, it is preferable to select the finger, since upon the palm of the hand it is not easy to determine the exact spot that has been reproduced and to designate it exactly upon different hands.

With these few remarks we have not exhausted the subject as regards the evidence of a long persistence of these lines in man, the infinite variety of their arrangements, and the classification that may be made thereof. Upon these special points we have expatiated in two works, to which the reader interested in this study may refer: Finger Prints, London, 1892, and Finger Prints Direction, London, 1895.—Francis Galton, in La Science en Famille.

A MOSAIC PORTRAIT OF VIRGIL.

At the meeting of the Académie des Inscriptions et Belles Lettres, of Paris, held on November 27, 1896, Mr. Gauckler, directeur du service des antiquités et des arts de Tunisie, presented a report in regard to a recent discovery which has attracted a great deal of attention all over the civilized world. While preparing the ground for the construction of their barracks near Susa, Tunis, one of the Algerian regiments unearthed a mosaic which, as the French savants believe, is a portrait of the Roman poet, Publius Virgilius Maro. It is a little more than a yard square and, as will be seen by reference to our engraving, reproduced from the "Bulletin de l'Académie des Inscriptions et Belles Lettres," represents Virgil composing the Æneid. He wears a loose white tunic edged with blue and is seated on a chair with a back, while his feet rest on a stool. He holds a roll of parchment on which is clearly written the eighth verse of the first book of the Æneid. He seems to be listening to the muses Clio and Melpomene. Clio, the muse of history, stands at his right holding a papyrus roll from which she is reading. A yellow scarf falls from her shoulder over the long, simple blue tunic. At his left stands the muse of tragedy, Melpomene, resting her elbow on the back of Virgil's chair while she listens attentively to her sister's reading. Her garment of purple brocade, heavily embroidered with green and gold, is rich and theatrical, and in her left arm, over which a dark blue mantle is thrown, she holds the tragic mask. She wears the appropriate buskins. Both of these daughters of Zeus and Mnemosyne wear the crown of Ephen in their hair. The conception of the picture is excellent, and the artist knew how to enhance the value of his work by a skillful gradation of tones and by a careful contrast of color.

The French savants are of the opinion that the Susa mosaic dates from the first century, and value it highly not only for its artistic merits, but also for its historical interest. They call it the first authentic portrait of Virgil, for they maintain that none of the others said to be portraits of him bear the slightest trace of genuineness. All we know of the features of the poet is the little to be gained from a vague description and some allusions in the writings of Donatus and Horace, and yet busts of him have ornamented schools and public libraries for centuries. There are some miniatures of Virgil, the oldest of which is in the Vatican. The

MINIATURE OF VIRGIL IN THE VATICAN.

"Bulletin de l'Académie des Inscriptions et Belles Lettres" says that this was supposed to date from the fourth century, but really belongs to the sixth century; so that it has no real iconographic value, and questions the correctness of the Susa portrait, which it says must have been made at least one hundred years after his death. It thinks that it must have been a reproduction of some painting, or, more likely, of one of those vignettes of which Martial speaks and which decorated the first pages of the written editions of Virgil's poems.

The French savants place considerable weight on the resemblance between the Susa portrait and the Vatican miniature, which seems to prove that Virgil had short hair, and to cast a doubt on the authenticity of the head of Virgil in the museum at Mantua and on numerous busts, all of which represent him as a young man with idealized features and long hair that is held in place by a band and then falls over his shoulders. The face in the Susa mosaic is not idealized at all, in fact, it is quite commonplace, with high cheek bones, low forehead, features of the rustic type and a prominent chin, which is also quite noticeable in the miniature of the Vatican. If this portrait does nothing more, it shows the high estimation in which Virgil was held in Africa, although it is not known that he ever went there. He was read everywhere, his verses were taught in the schools and some tried to imitate him.

The learned Frenchmen are divided as to the period to which this portrait should be credited; neither it nor the miniature referred to bear any date; but it is known that the harbor of Susa, the ancient Hadrumetum of the ancients, filled in with sand at an early date, and consequently the city was abandoned in the second century. This fact and the extremely artistic execution of the mosaic seem to furnish very good grounds for ascribing the mosaic to the first century after Christ. The mosaic has been placed in the hall of the Barracks at Susa by Col. Decluzelle, from which it will be removed later for exhibition to the museum of the Bardo Palace, in Tunis, the former harem of the Bey.

MOSAIC PORTRAIT OF VIRGIL EXCAVATED NEAR SUSA, IN TUNIS.

Recent reports to the British Foreign Office call attention to the want of railways in the Canary Islands. It is said that the traffic from Santa Cruz to Laguna, 1,850 feet above the sea, would warrant the construction of a rack or wire rope railway.

PRIMITIVE MAN IN EGYPT.*

The excavations which have been carried on in Egypt during the last twenty years have had as their object the acquisition of antiquities rather than the scientific investigation of the numerous problems anent the early Egyptians and their predecessors, which still, unfortunately, remain unsolved. It cannot be denied that public interest in the work depended largely upon the value of the facts which could be deduced from the study of Egyptian antiquities in their relation to the history of the sojourning of the children of Israel in Egypt, and it is only quite lately that attempts have been made to treat the various branches of Egyptology from a comparative point of view. Moreover, a mistaken idea had gone abroad about the ability of the Egyptologist to settle the difficulties which constantly cropped up, and the philologist was thought to be able to give a final answer to every question which was propounded to him.

It is now quite clear that the knowledge of the Egyptians is a subject sufficiently large to admit of the useful occupation of purely scientific men in addition to the philologist; and the sooner this fact is generally recognized the sooner we may hope that fresh light will be thrown upon the dark and somewhat mysterious past of the early Egyptians. A limit must be reached some day in philological knowledge of Egyptian archæology, and our hope for further facts must rest upon those who are able to put before us the interpretation of the story of Egypt's past, which is written in her mountains and mud.

It will be remembered that the labors of Mariette and Maspero were devoted entirely to the collecting of antiquities and to the publication of texts and papyri and to the general administration of the Egyptian Museum of Bûlâk and Ghizeh. Their successor, however, M. J. de Morgan, has approached the duties of his post with a larger view of their possibilities, and he has devoted himself to the consideration of the ancient country of Egypt rather than to its language. The results of his excavations have, notwithstanding, been important, and the jewelry of Dahshûr will for long claim the attention of all lovers of art and of all admirers of technical skill in the working of metals.

It is our purpose not to discuss these results, but to draw attention to his geological investigations which he describes in the work before us, for here we have presented a series of facts which have been brought together by a trained observer of physical phenomena, and a number of deductions which claim the careful thought of those who deal with the science of anthropology.

By the aid of "black and white" maps, we have a brief account of the early geological changes which took place in Western Asia and resulted in the formation of Egypt, and the old course of the Nile now called "the river without water," and its relation to the bases are fully described; this is followed by an account of the gradual development of the Nile as we know it, and the causes which produced the fertile lands on each side of it. The first peoples who lived on the latter were the autochthonoi, who perfected the art of stone polishing; who became almost civilized and who were known by the historical Egyptians as the "followers of Horus." These M. de Morgan divides into two classes, i. e., paleolithic and neolithic. Of paleolithic man many remains have been found, and four places at least where it is certain that he flourished are now well known, and many examples of his stone work are figured on pp. 57–66 of M. de Morgan's book.

Passing next to the remains of neolithic man, we find that numerous sites, both in Lower and Upper Egypt, produce objects which prove his skill and knowledge. These are here described with care, and the deductions which are to be made from the objects on each are soberly stated.

Without going into details, M. de Morgan proves with tolerable certainty that we have authentic remains of the historic Egyptians of the first and second dynasties, and there are many objects known to him which he would attribute unhesitatingly to the period immediately preceding. Here, naturally, comes an account of M. Amélineau's discoveries, which have stirred up a great deal both of interest and strife, and a statement of the excavator's own views on the subject has been given from his paper, entitled Les Nouvelles fouilles d'Abydos, Angers, 1896. Whether the objects found in the tombs at Amrah, near Abydos, belong to as early a period as M. Amélineau asserts, or whether they come from what M. de Morgan calls "tombes de transition," and are to be attributed to the kings of the autochthonoi of the time of the first and second dynasties, or whether they belong to a much later period, as Brugsch Bey, Maspero and Petrie declare, cannot be decided offhand; but there is no doubt whatever that they are exceedingly ancient, and that they form a sort of halfway stage between the antiquities of the sixth dynasty and those of the period somewhat anterior to the reign of Menes. At all events, they form a factor which must be reckoned with, and they are not to be lightly poohpoohed without careful study. We agree with M. de Morgan that they are of royal origin, and that they indicate a transition period when both polished stone and metals were used as materials for weapons.

Following these considerations, M. de Morgan shows by a figure how the skeleton, vases, etc., were arranged in the tombs of Amrah, and some hundreds of drawings illustrate the flints and other objects found therein. The painted vases are, naturally, the antiquities to which the attention of most readers will be drawn, and it seems tolerably certain that few archæologists in the present state of the case will agree in their deduction as to date and period. With the advent of the historical Egyptian, neolithic man disappeared in Egypt, and then came into being the monuments which have long excited the wonder and admiration of the whole civilized world.

But where did this Egyptian come from? M. de Morgan agrees with many in thinking that he came from Asia, and he looks upon Chalden or Southern Babylonia as his probable home; but many will be surprised to learn that the fellah, or peasant countryman, whom many experts have regarded as the lineal descendant of the Egyptian who built the pyramids and

* Recherches sur les Origines de l'Egypte. L'Age de la pierre et les metaux. Par J. de Morgan. Pp. xiv + 270, large 8vo. (Paris: Leroux, 1896.)—Nature.

temples, is the product of the mingling of the autochthonoi with Nubians and Egyptians. In an "Appendix" Dr. Fouquet, the famous craniologist, gives the results of his examination of nineteen boxes of bones from Amrah, and, though asking his readers to suspend their judgment for the moment, he seems to be on the whole inclined to believe generally in the great antiquity assigned to the tombs and their owners by MM. de Morgan and Amélineau. M. de Morgan's book bristles with interesting points, but many are, unfortunately, debatable, and there can be no doubt that some of his views will be rejected by his fellow workers. The value of his book consists not only in the newness of the facts which he produces, but also in the carefulness of his arrangements of them and the deductions therefrom; and something is to be said for the honesty which he displays in discussing subjects with which he is well acquainted, and in leaving those of which he has no special knowledge to the investigations of experts.

THE DUSSAUD MICROPHONOGRAPH.

SOME new experiments have recently been made by M. Dussaud apropos of the perception of sounds by deaf mutes by means of an apparatus devised for the purpose and called a "microphonograph."

FIG. 1.—Instantaneous Photograph taken before the Apparatus began to Operate.

FIG. 2.—Instantaneous Photograph taken while the Apparatus was in Operation.

EXPERIMENT WITH A DEAF MUTE.

The microphonograph is an apparatus that serves to amplify the voice, just as a lens enlarges an image, and so it opens in the sciences a new chapter that may be entitled "microphonography," or the microscopy of sound.

In an auscultation this new instrument will permit of studying the feeblest sounds of healthy or diseased organs, and, on another hand, will render immense services to the deaf and to deaf mutes.

In January, 1896, M. Dussaud, touched by the fate of an unfortunate deaf mute, resumed a study that he had begun some time before, and applied his efforts to the finding of an apparatus that should increase the intensity of sound at will. After a year of research, he, on the 20th of December last, operated with entire success, before a certain number of physicians, in the laboratory of physiology of the Sorbonne, the instrument to which he has given the name mentioned above.

The amplification of sounds seemed extraordinary, and on the next day Dr. Laborde, superintendent of the laboratory of physiology, presented to his colleagues of the Academy of Medicine the result of the observations that he had made with the apparatus under consideration.

This microphonograph consists of two parts, a registering apparatus and a repeater.

The Registering Apparatus.—This consists (Fig. 3) of a horizontal cylinder actuated by clockwork. Upon this cylinder is fixed a wax roller in front of which a piece of the size and shape of a watch is moved through a mechanism. This piece is formed essentially of small electromagnets that act upon a disk which controls the tool that is designed to engrave the wax. For registering feeble sounds, there is placed in the region corresponding to the organ to be examined a microphone of a peculiar system, that is connected with the microphonograph registering apparatus by an electric current derived from 1 to 60 small sulphate of mercury elements. Through the intermedium of this current, the sounds collected by the microphone are faithfully repeated by the disk of the microphonograph and inscribed upon the wax by the graver.

It was possible in this way to register the pulsations of the heart of a young man in whom a crisis of palpitations had just been artificially determined.

In this manner, too, may be ascertained the variations that occur in the rhythm and pulsations of the beating of the heart.

In an analogous way, M. Dussaud has registered the crises due to the mental disturbances of the artist and orator.

Hereafter not only song and speech may be preserved, but also the emotions of the mind; in a word, it is a registering of life.

In impassioned strophes that require the entire strength of an individual, we find quicker and harder strokes, and true internal emotions that are shown by graver and more metallic sounds that it will be possible to preserve forever as witnesses of the hours in which one feels that his entire soul is in vibration.

It is possible to inscribe the slightest sounds perceived in the different affections of the lungs and heart. The importance of such an instrument for auscultation and diagnosis may be easily perceived. Everything is registered and may be repeated ten thousand times without undergoing any alteration. The ears of students of medicine will be able to become habituated to hearing all the sounds made by the organs, whether healthy or diseased. The apparatus repeats what the master has just heard, and the student may thus learn how to distinguish between these sounds and those that follow and may vary in a certain measure. The professor of internal pathology, through this apparatus, will be able to cause his auditors to hear all the normal and abnormal sounds of the human body.

The practitioner will thus be able, with the aid of his observations, to hear anew the pathological sounds that he heard at the time of his first visit and thus ascertain the progress of the disease.

On the other hand, in difficult cases, when there are several physicians, or when it is necessary to hear the sounds produced at different times, in order to ascertain the state of an organ, a single application of the apparatus will permit of listening to them indefinitely without fatigue to either the physician or patient and unbeknown to the latter.

It is a study of the infinitely small in the domain of sounds. Who knows the revelations that await us?

M. Basaldu, an American engineer, has already consulted Mr. Edison on the subject of some work that he wishes to undertake with an extra sensitive Dussaud microphonograph. It is a question of registering the sounds of thought.

In the hours of intense cerebral activity there occurs, through the flow of the blood, a series of sounds in our brain, the skull of which is the resonator. Thought is a sound that is imperceptible to our ears and is, perhaps, a mysterious and sweet harmony which goes off to fill the unknown media in which it is agitated and in which the psychic and telepatic phenomena occur. In another order of ideas, M. Dussaud, through a horizontal microphone, has registered the infinitesimal sounds that insects produce through their walking or the friction of certain organs. Here again there is a host of curious notions that have been ignored and that throw a singular light upon the habits of these beings, which also have their musical sense and their preferred fashion, if we may so express ourselves, and that sometimes move with odd and varied cadences that are proper to them. Who can say whether or not they find agreeable sensations in their rhythms, and whether or not ants, in their long processions, have certain definite gaits that recall our military step?

It is an immense and fruitful horizon that has just been suddenly opened up in the field of physiology, medicine and natural history.

The Repeater.—This likewise consists of a horizontal cylinder actuated by clockwork. Upon this cylinder is placed the wax roller engraved by the registering apparatus, and, before this, a mechanism moves a disk provided with a rounded style. Upon this disk there is fixed a small microphone provided with micrometer screws, springs and levers.

Such, in its essential parts, is the microphonograph repeater. In order to make use of it, an electric current from a sulphate of mercury battery is made to pass into the apparatus. This current, after traversing the microphonograph, reaches a receiver analogous to that of telephones. In this is then heard what has been inscribed upon the wax with an intensity that varies from the feeblest to the greatest, according to the current used.

Fig. 1 represents a deaf mute whose face has its expression of habitual sadness, since the apparatus is not in operation.

Fig. 2 represents the same lad, from an instantaneous photograph taken while the apparatus was playing the Marseillaise. His countenance immediately expanded and he instinctively began to beat the measure. This subject, who was so deaf that he could not hear a word shouted in his ear as loudly as possible, manifested his pleasure as soon as he put his ear to the microphonograph, and left the instrument only with regret.

Attention is now being paid to the auditory education of young deaf mutes by means of the apparatus under consideration. To this effect they are made to hear the sound of the different vowels a thousand times over. It will be conceived that such an awakening of the sense of hearing will greatly facilitate their use of speech, which, up to the present, they have been able to acquire only through a study of the motion of the lips. It must not be forgotten that deaf mutes are mute only because, being deaf, they have never heard any sounds, and that the microphonograph, by giving them a perception of sounds while they have vestiges, as feeble as they may be, of auditory capacity, is of great help in improving their pronunciation, which, as a general thing, is very defective.

As regards the deaf, sensible improvements in their hearing have, in many cases, been effected by applying the apparatus two hours a day for a certain length of time. This is very natural, since the deaf are those who ought to be spoken to the most, but who are spoken to the least, on account of the fatigue experienced by the speaker. Their auditory faculties become feebler and feebler for want of exercise, and, moreover, if one of their ears is better than the other, they give it their entire attention and the poor ear becomes still more defective every day. The microphonograph, through auricular gymnastics, awakens the slumbering organs and stimulates them by forcing them to vibrate by its sounds, which are so powerful that a normal ear cannot stand them, even for a second, without experiencing severe pain.

Besides, the apparatus constitutes an audiometer, which is very precise by the number of elements necessary to reach perceptible sounds. The apparatus, therefore, measures deafness, and from this point of view alone will prove of great utility in medicine for ascertaining the improvements or aggravations in the different phases of a treatment or in the various periods of human life.

Pursuing his researches, the inventor, in view of the Exposition of 1900, is working at present on a microphonograph of large dimensions, capable of supporting strong currents, and calculated for making the voice heard by 10,000 persons, and in which, too, the registering apparatus and repeater, which are ingeniously combined in the same instrument, will permit of repeating while the inscribing is being done.

This will doubtless constitute one of the most original things of the forthcoming exposition.

We cannot do better in closing than to quote the following words of Dr. Laborde:

"We have here a whole science in embryo—microphonography, or the study of the feeble sounds of healthy or diseased organs. As sound is something infinitely transitory, it must be fixed in order that it may be studied. This is what is done by the phonograph, but only with sounds of a certain intensity. Moreover, up to the present, the sounds inscribed upon a wax cylinder have been studied only with the ear. M. Dussaud has thought that it was necessary, especially for feeble sounds and defective hearing, to amplify the sound inscribed, and, in the microphonograph, has furnished the first 'microscope' for magnifying feeble noises and the first 'spyglass' for defective hearing."—La Nature.

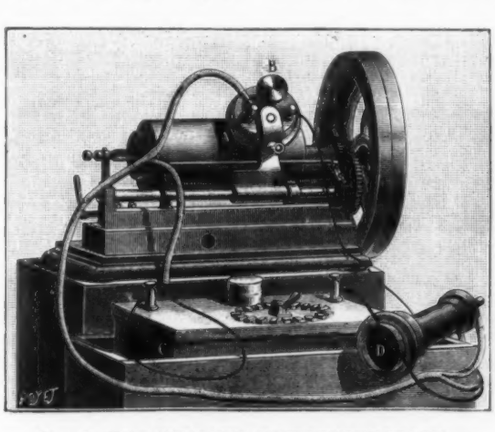


FIG. 3.—THE DUSSAUD MICROPHONOGRAPH.

A, horizontal cylinder; B, registering microphone; C, electric batteries; D, telephone receiver.

SIBERIA AS A GRAIN-EXPORTING COUNTRY.*

IN a recent number of Dr. Conrad's Jahrbücher für Nationalökonomie und Statistik, there appeared an article by Dr. Bailod "Concerning the importance of the husbandry of Siberia." Considering the interest which Siberia is entitled to claim as a mighty field for colonization lying at the doors of Europe on the one

* United States Consular Reports.

side and the importance which it seems to acquire as a new grain-producing region on the other, it is especially gratifying when the results of careful investigation enable the widest possible circles to form an opinion as to the actual conditions of the country.

As Dr. Ballod remarks, Siberia has often been compared with the United States and the opinion expressed that it presents to Russia quite as great and profitable a field for colonization as did once North America to England. This comparison as to what hopes and fears Siberia has given and may possibly give rise to is perhaps the best form of regarding the question. Nevertheless, such a comparison is thoroughly out of place, because, in respect to climate, conditions of soil, and capabilities of expansion of the regions still available for colonizing purposes, Siberia corresponds fairly with Canada, and, moreover, it contains almost the same number of inhabitants. The region of the Amoor is, likewise, no better for colonization than British Columbia, inasmuch as it, too, has in the summer time an equally overmoist and unfavorable climate for grain growing.

With regard to the colonization of Siberia, the immigration (only that which comes from Russia is worth taking into consideration) has increased very largely of late. While in the eighties it hardly amounted to 10,000 to 20,000 annually, it rose in 1895 to over 100,000. It is claimed that in the present year, up to the middle of June, the number had risen to 145,000, so that neither could suitable provision be made for the new arrivals nor was enough surveyed land available. Dr. Ballod thinks that one may safely reckon on 200,000 to 250,000 immigrants for the next few years. Even European Russia would not sustain any palpable loss by such an outflow of emigrants, for her annual excess of births over deaths amounts to over 1,500,000 souls, so that the fear of some few strips of land in European Russia, which are now devoted to farming, becoming depopulated and of a want of farming hands being felt is thoroughly unjustified.

But with so strong an immigration as that referred to above, the land available for cultivation would hardly suffice for twenty-five years. The total area of cultivable soil in eastern and western Siberia and Transbaikalia amounts to 18,000 geographical square miles, or, in round figures, 247,000,000 acres. But of these millions, at least 98,000,000 acres must be left to the present owners, even if their possessions beyond 18 dessiatines (48¼ acres)—which is the limit allowed by law to each head—should be confiscated. For the new settlers, the government allows 15 dessiatines (40½ acres) per male. Besides this, one-fourth of the lands is to be held in reserve for the future growth of the population. According to this, there would be about 112,000,000 acres available for the immigrants, and thereon 3,000,000 males, making 5,500,000 for the whole, could settle.

The country population would thus have grown to the extent of 150 per cent., and they would be able to produce two and a half times as much grain as the present population. Siberia, exclusive of the Amoor region, could then raise 400,000,000 poods (6,453,000 tons) of grain; or, if the area of the grain-growing districts increase in proportion to the present dimensions by 25 per cent., 500,000,000 poods (8,000,000 tons), that is to say, only one-fourth or one-fifth of the entire Russian grain harvest. There would thus be from 87,000,000 to 110,000,000 poods (1,402,000 to 1,773,000 tons) available for export, after providing for the population of the cities, towns, and mining districts, instead of 35,000,000 to 44,000,000 poods (550,000 to 710,000 tons). This would only represent about 11 to 12 per cent. of the soil suited to grain growing, whereas in western Europe, 25 to 30 per cent. of the agricultural land is devoted to this purpose. The production represented by the above figures is, however, capable of being increased to the extent of from two to two and a half times, but not without careful cultivation of the soil by manuring, etc. Assuming, however, that the area of the grain land should increase to 25 per cent. of the total cultivable land, and that thus the quantity available for export should rise to from 174,000,000 to 220,000,000 poods (2,805,000 to 3,546,000 tons), this would still not amount to 50 per cent. of the present total Russian export. However, this would not happen before forty or fifty years at the earliest. In the meanwhile, the exports from European Russia would most certainly have become greatly reduced, in consequence of the strong increase of the population, and even, possibly, have ceased altogether.

The Amoor and Ussuria, which have not been taken into account in the foregoing, are said to contain about 28,000,000 hectares (69,100,000 acres) of cultivable land. That these will ever be able to send desirable grain, and more particularly wheat, to the European market appears doubtful, on account of the bad quality of the grain raised there. It is more likely that they may provide the markets of northern China with millet, etc.

A great increase in the cultivation of grain as a consequence of the eventful completion of the Siberian railway system is, as the author seeks to prove from careful estimates of production and freights in his possession, not to be expected so long as low prices rule on the markets of the world. It would be necessary for the Siberian peasant to export more cheaply than he has hitherto, in the absence of railways, been paid for his grain on the home markets. But should the prices of the markets of the world rise materially, the profitable cultivation of wheat in middle Siberia would become a possibility, and this would probably bring about an important increase in exports.

Dr. Ballod arrives at the conclusion that the Siberian railway will at first only open up the country for the export of the more valuable classes of goods and facilitate wholesale immigration. It will be of enormous importance as a transit route for goods of high value from China and Japan, and also for passenger traffic from and to these countries; but it will be serviceable to the development of grain export only in a very limited degree. This end could only be attained by the construction of cheaper export highways, which will, perhaps, follow with the progress of colonization.

THEODORE M. STEPHAN,
Annaberg, November 26, 1896. Consul.

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